Jan. 9, 1951 C. J. KLEIN 2,537,675

APPARATUS FOR BRUSHING A STRIP

Filed March 11, 1947 3 Sheets-Sheet 1

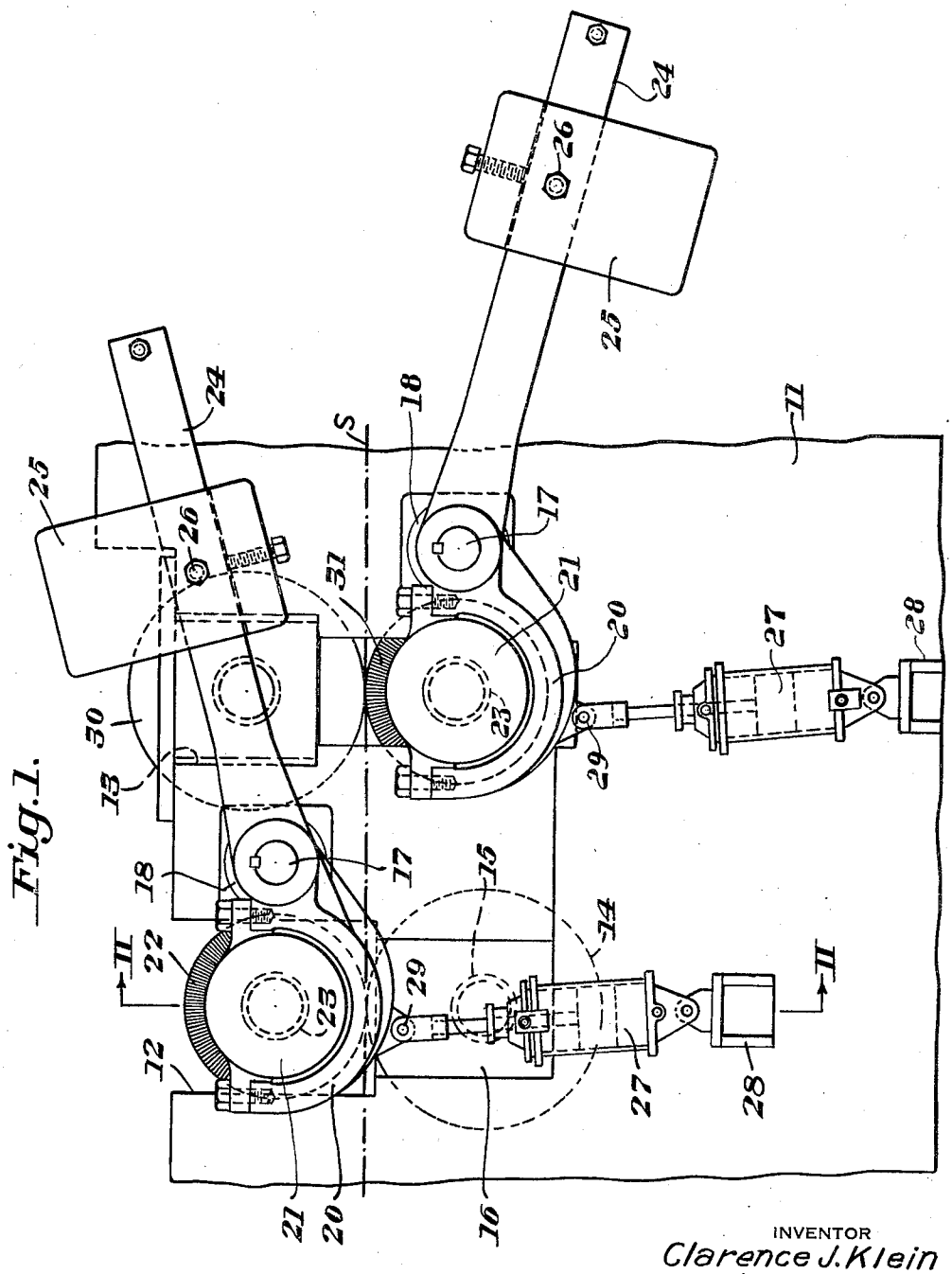


Fig. 1.

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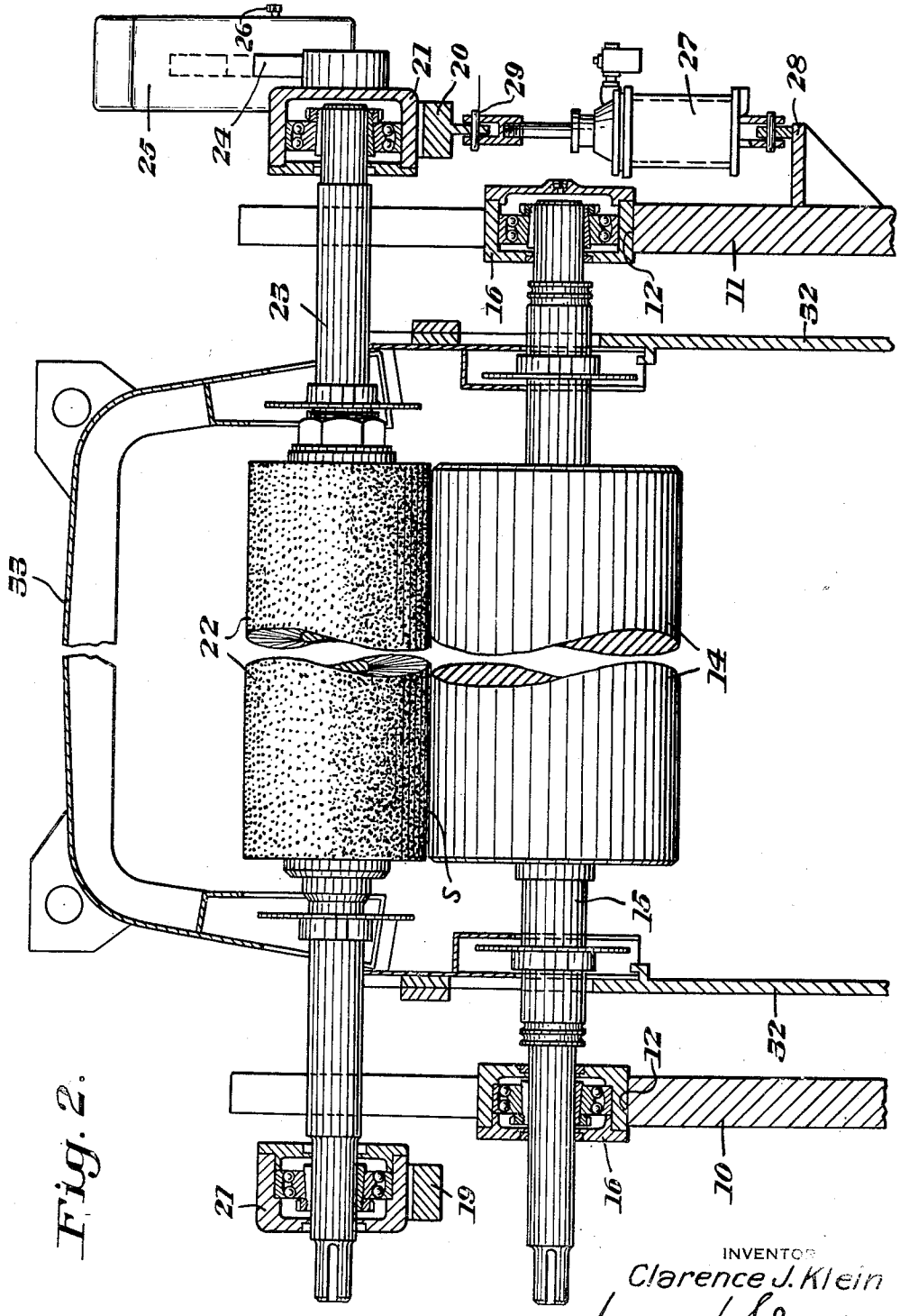


Fig. 2.

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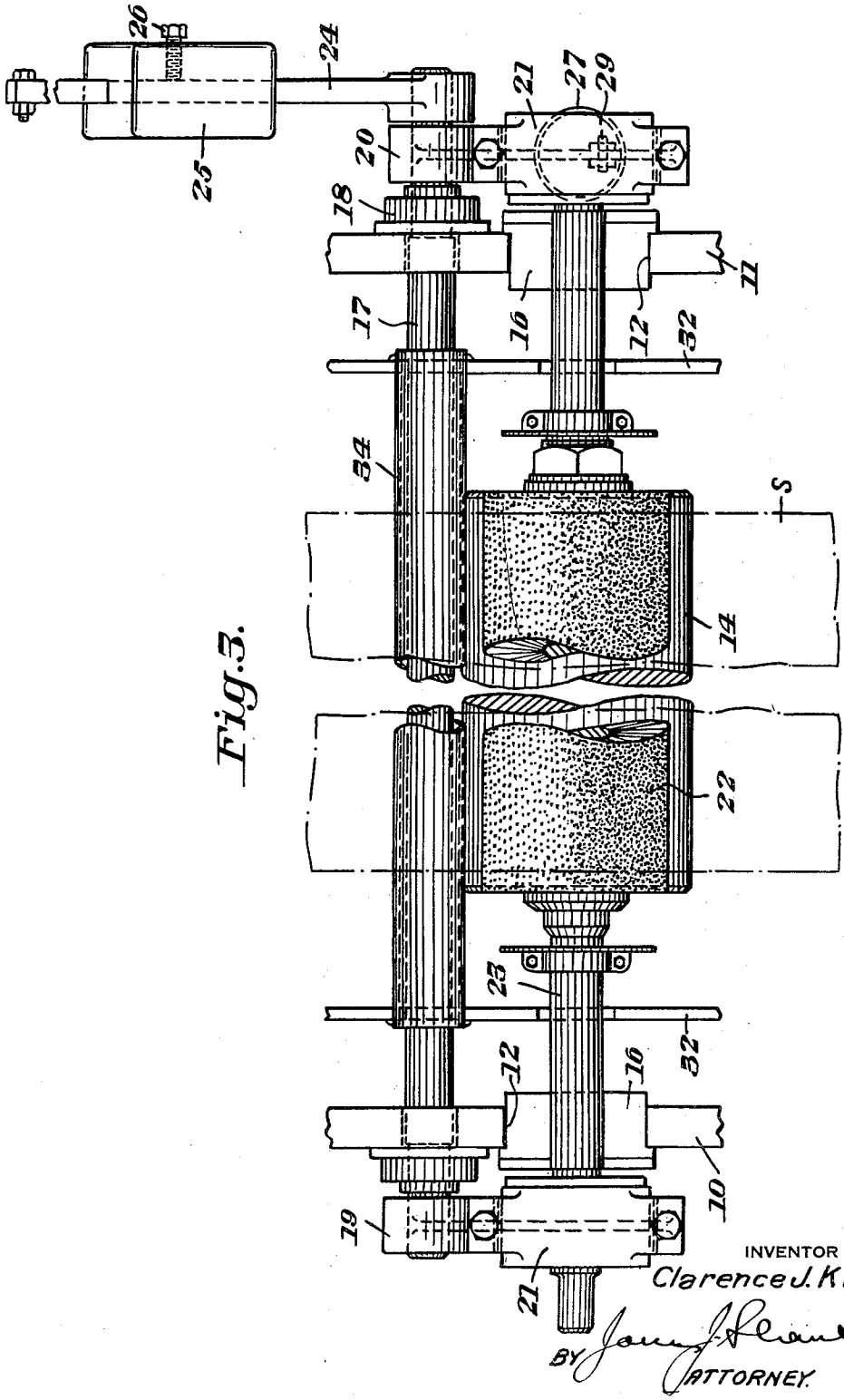


Fig. 3.

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APPARATUS FOR BRUSHING A STRIP

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7 Claims. (Cl. 15—77)

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My invention relates to apparatus for brushing strip or sheet material and, more particularly, to a mounting for a rotary brush with provision for controlling the pressure exerted by the brush on the sheet material.

In the continuous processing of sheet material such as steel strip it is desirable at certain stages to clean the material with rotary brushes in order to remove loose scale and dirt. For satisfactory cleaning it is important that the brush exerts just the proper pressure on the material. Excessive pressure will cause bending of the bristles of the brush so that they are dragged over the surface of the work and produce a rubbing action rather than the desired brushing action. This increases the wear on the bristles and correspondingly shortens the life of the brush. With the correct pressure, only the ends of the bristles will strike the work and efficient brushing action will result. The exact pressure required for efficient brushing varies with the speed of the brush and the character of both the bristle material and the material to be removed by the brush.

I have invented a novel mounting for rotary brushes whereby they may be caused to exert just the right pressure on the material at all times. In a preferred embodiment, I provide a rotary brush cooperating with a roll or other traveling support for the strip to be cleaned which passes between the brush and the roll. The brush is journaled in bearing arms pivoted on an axis parallel to but offset from the brush. I provide a counterbalance lever rigid with the bearing arms for holding the brush against the strip with the desired pressure, and means for moving the brush away from the strip when desired as for the purpose of threading a fresh length of strip between the brush and the roll.

A complete understanding of the invention may be had by referring to the accompanying drawings illustrating a preferred embodiment. In the drawings,

Figure 1 is a partial side elevation of a brushing apparatus including upper and lower rotary brushes and back-up rolls cooperating therewith;

Figure 2 is a transverse section along the line II—II of Figure 1, showing parts in elevation; and

Figure 3 is a partial plan view showing a single brush and back-up roll.

Referring in detail to the drawings, the apparatus of my invention is positioned on spaced plates 10 and 11 which may conveniently be the side walls of one of the tanks of a strip pickling

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or cleaning line. In any event, the plates 10 and 11 are such as to constitute a rigid supporting frame. The plates have notches 12 and 13 therein. A bottom support roll 14 is mounted on a shaft 15. The shaft 15 is journaled in bearings 16 seated in notches 12.

A rock shaft 17 is journaled in bearings 18 secured to the side plates adjacent the notches 12. Bearing arms 19 and 20 are secured to opposite ends of the rock shaft and have bearings 21 seated therein. A rotary brush 22 has a spindle 23 journaled in the bearings 21. A counterbalance lever 24 has a counterweight 25 adjustable therealong and is connected to the bearing arms 19 and 20 by being secured to one end of the rock shaft 17. Set screws 26 permit the counterweight to be clamped in any desired position on the lever 24.

It will be apparent that strip designated S, passing between the roll 14 and brush 22 will be effectively cleaned on its upper surface if the brush is driven at an appropriate speed. Both the shaft 15 of the roll 14 and the spindle 23 of the brush 22 are adapted to be coupled to suitable driving means. The roll is driven at a peripheral speed corresponding to that at which the strip is advanced. The brush is driven at a peripheral speed greater than that at which the strip travels. The brush may be driven in the reverse direction relative to the travel of the strip. In that case, its speed need not be so great. The brush drive preferably includes a flexible coupling to permit movement of the brush away from and toward the path of the strip.

The brush 22 is urged against the strip by a force equal to the product of the effective weight of the brush, its bearings and the arms 19 and 20 by its moment arm about the axis of the rock shaft 17, less the product of the effective weight of the lever arm 24 and counterweight 25 by its moment about the same axis. The exact pressure exerted by the brush on the strip, therefore, may be controlled by adjusting the counterweight to the proper position along the lever arm. If a relatively light pressure is desired, the counterweight is adjusted along arm 24 away from the shaft 17 so that the counterweight nearly counterbalances the brush, its bearings and the bearing arms. If a heavier pressure is desired, the weight 25 should be adjusted along arm 24 toward the shaft 17 to reduce the counterbalancing force.

I provide power means in the form of a fluid-pressure cylinder and piston 27 for raising the brush 22 when desired, as in the case of thread-

ing a fresh strip between the brush and the roll. The cylinder is pivoted to a bracket 28 mounted on the side plate 11 and has its piston rod pivoted to the bearing arm 20 at 29. In addition to raising the brush when threading a fresh strip, the cylinder may have fluid trapped on both sides of the piston to damp any tendency of the brush to bounce or vibrate during normal operation when strip is passing between it and the roll.

A back-up roll 30 is journaled in bearings seated in the notches 13 for cooperation with a rotary brush 31 generally similar to the brush 22, the only difference being that roll 30 is above the brush 31 and that the latter engages the lower surface of the strip. The counterweight 25 for the brush 31, of course, is positioned to overcome the weight of the brush, its bearings and supporting arms and cause the brush to exert the desired upward pressure against the strip.

Side guards 32 are spaced inwardly of the walls 10 and 11 and a hood 33 extends therebetween forming an enclosure for the brushes. The hood is removed in Figures 1 and 3. A tube 34 surrounds the shaft 17 between the side guards.

It will be apparent that my invention is characterized by several advantages. In the first place, it permits the rotary brushes to be urged against the strip under precisely the exact pressure necessary to produce the most effective brushing action. It also makes possible the retraction of the brushes to facilitate the entry of a fresh length of strip. In addition, the apparatus is relatively simple and inexpensive in construction and does not introduce any difficulty by way of maintenance or operation. As illustrated, the structure involved is such as to permit brushes to be located above and below the path of the strip whereby both surfaces may be cleaned continuously without changing the direction of strip travel.

My invention permits the brushes to be readily reversed and individually driven at varying speeds depending upon the nature of the strip, although they are preferably operated at peripheral speeds in excess of that of the strip. Any suitable drive for the brushes may be employed. The back-up rolls are driven independently of the brushes since they operate at a peripheral speed substantially equal to the linear speed of the strip.

Although I have described a preferred embodiment of my invention it is to be understood that the invention is not so limited but may be otherwise embodied within the scope of the following claims.

I claim:

1. Apparatus for brushing a strip as it is moved along a path, said apparatus comprising means disposed along and at one side of such path in position to engage a surface of such moving strip and confine the strip to said path, bearing arms pivotally supported on an opposite side of said path, a rotary brush journaled in said arms for engaging the opposite surface of the moving strip, and counterbalance means connected to at least one of said arms and causing the brush to engage said opposite surface of the moving strip with a predetermined pressure under the influence of gravity.

2. Apparatus for brushing a strip as it is moved along a path, said apparatus comprising a roll journaled in fixed bearings and disposed at one side of such path in position to engage a surface of the moving strip, a shaft parallel with said roll and disposed on the opposite side of said path, bearing arms mounted on said shaft and pivotally movable in an arc about the axis of said shaft, a rotary brush journaled in the arms in position to engage the opposite surface of the strip, a counterbalance lever rigid with at least one of said arms, and a counterbalance weight adjustable along said lever for causing the brush to exert a predetermined pressure against the strip under the influence of gravity.

3. Apparatus for brushing a strip as it is moved along a path, said apparatus comprising means disposed along and at one side of such path in position to engage a surface of such moving strip to confine the strip to said path, counterbalanced bearing arms pivotally supported on opposite side of said path, a rotary brush journaled in said arms for engaging the opposite surface of the moving strip, and means for pivotally moving the arms to move the brush toward and away from the strip.

4. Apparatus for brushing a strip as it is moved along a path, said apparatus comprising a roll journaled in fixed bearings and disposed at one side of such path in position to engage a surface of the moving strip, a shaft parallel with said roll and disposed in the opposite side of said path, counterbalanced bearing arms mounted on said shaft and pivotally movable in an arc about the axis of said shaft, a rotary brush journaled in the arms in position to engage the opposite surface of strip, and power-actuated means for pivotally moving the arms about said shaft axis to move the brush toward and away from said opposite surface of the strip and said roll.

5. Apparatus for brushing a strip as it is moved along a path, said apparatus comprising means disposed along and at one side of such path in position to engage a surface of such moving strip and confine the strip to said path, bearing arms pivotally supported on an opposite side of said path, a rotary brush journaled in said arms for engaging the opposite surface of the moving strip, counterbalance means connected to at least one of said arms and causing the brush to engage said opposite surface of the moving strip with a predetermined pressure under the influence of gravity, and means for pivotally moving the arms to move the brush toward and away from the strip.

6. Apparatus for brushing a strip as it is moved along a path, said apparatus comprising a roll journaled in fixed bearings and disposed at one side of such path in position to engage a surface of the moving strip, a shaft parallel with said roll and disposed on the opposite side of said path, bearing arms mounted on said shaft and pivotally movable in an arc about the axis of said shaft, a rotary brush journaled in the arms in position to engage the opposite surface of the strip, a counterbalance lever rigid with at least one of said arms, a counterbalance weight adjustable along said lever for causing the brush to exert a predetermined pressure against the strip under the influence of gravity, and power-actuated means for pivotally moving the arms about said shaft axis to move the brush toward and away from said opposite surface of the strip and said roll.

7. Apparatus for brushing a strip as it is moved along a path, said apparatus comprising a first roll journaled in fixed bearings and disposed along such path in position to engage a surface of the strip, a second roll journaled in fixed bearings disposed along said path in position to engage an opposite surface of the strip, said rolls

being spaced apart along said path, a shaft parallel with each roll and disposed on the opposite side of said path from the corresponding roll, a set of bearing arms mounted on each shaft and pivotally movable in an arc about the axis of the shaft, a rotary brush journaled in each set of arms in position to engage the strip passing between the brush and the corresponding roll, counterbalance means connected to each set of arms and causing the respective brush to engage the strip with a predetermined pressure under the influence of gravity, and independent, power-actuated means for pivotally moving each set of arms about the corresponding shaft axis to move the respective brush toward and away from the strip.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,550,221	Nelson	Aug. 18, 1925
1,880,887	Dittmar	Oct. 4, 1932
2,307,046	Johnson	Jan. 5, 1943
2,416,594	Rennie	Feb. 25, 1947

FOREIGN PATENTS

Number	Country	Date
195,249	Germany	Feb. 14, 1908
42,927	France	Oct. 16, 1933