Feb. 3, 1942. F. C. BIGGERT, JR 2,271,537

BRANNER

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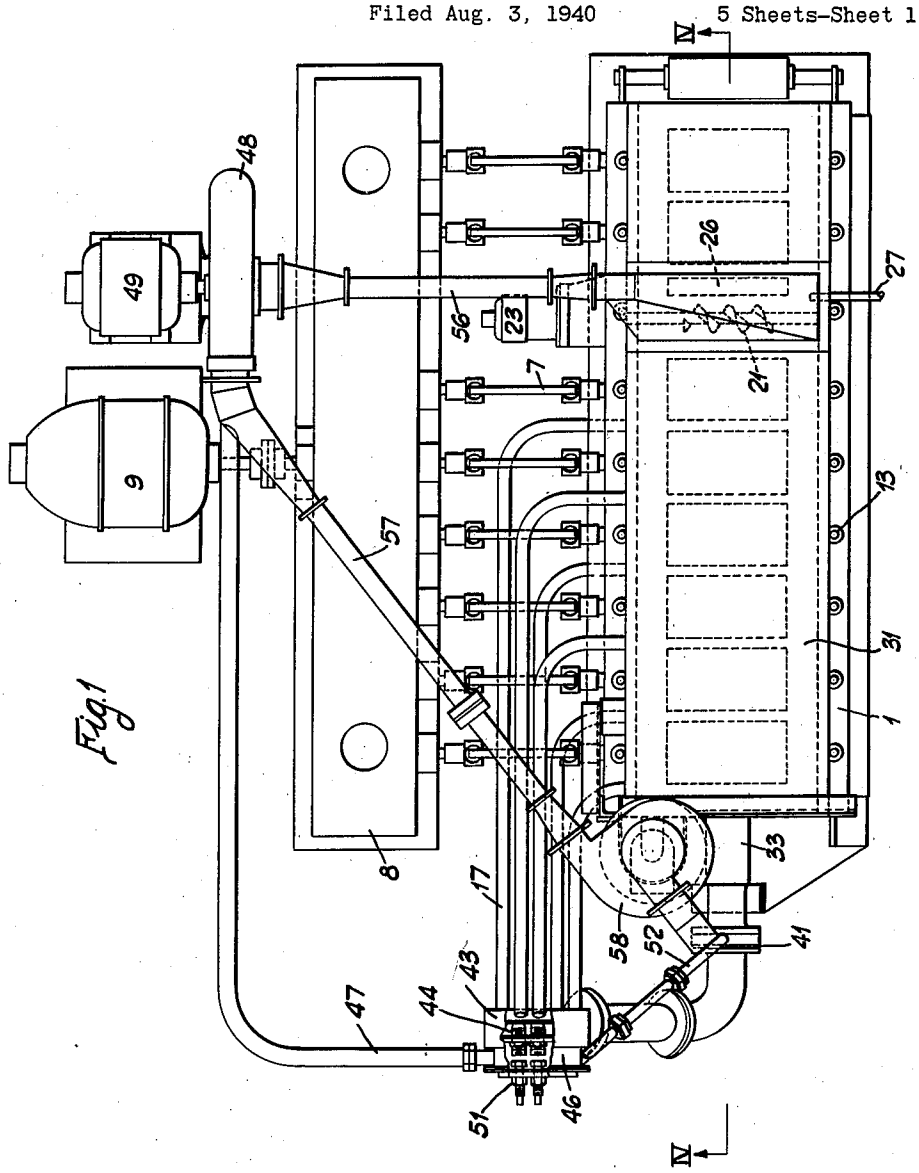


Fig. 1

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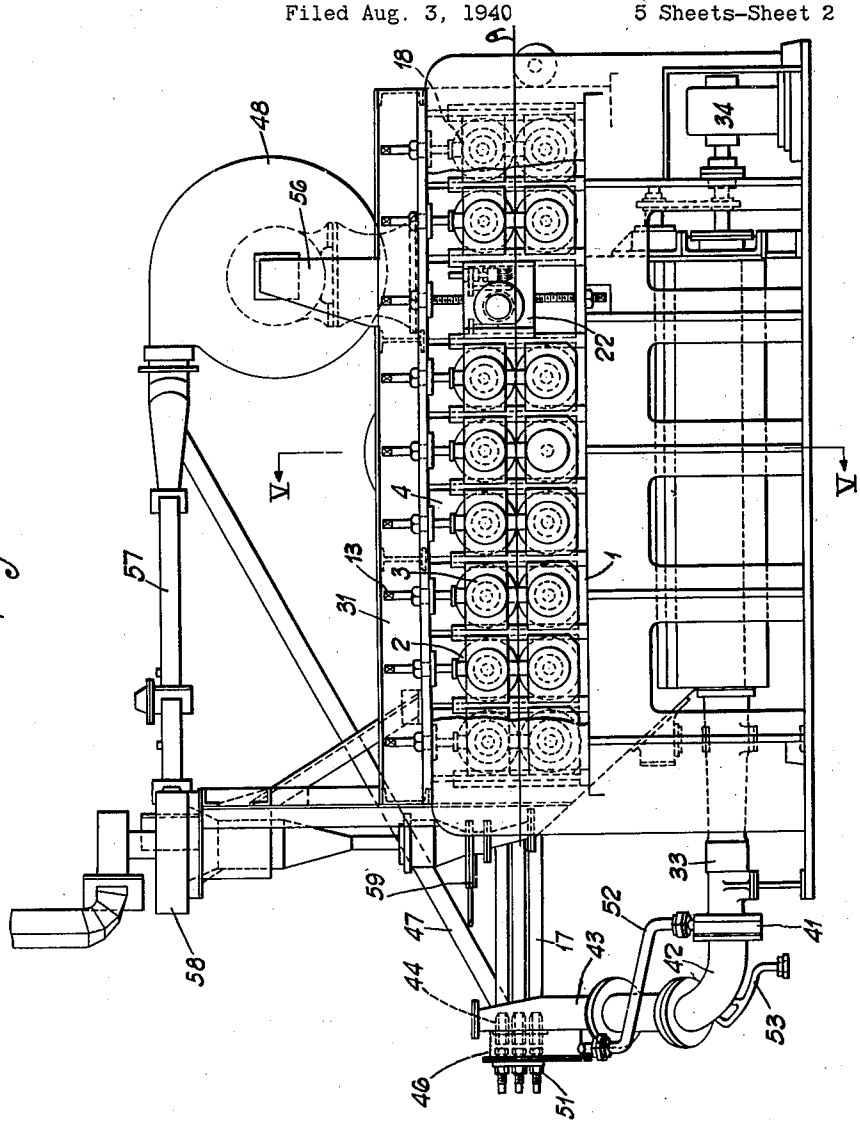


Fig. 2

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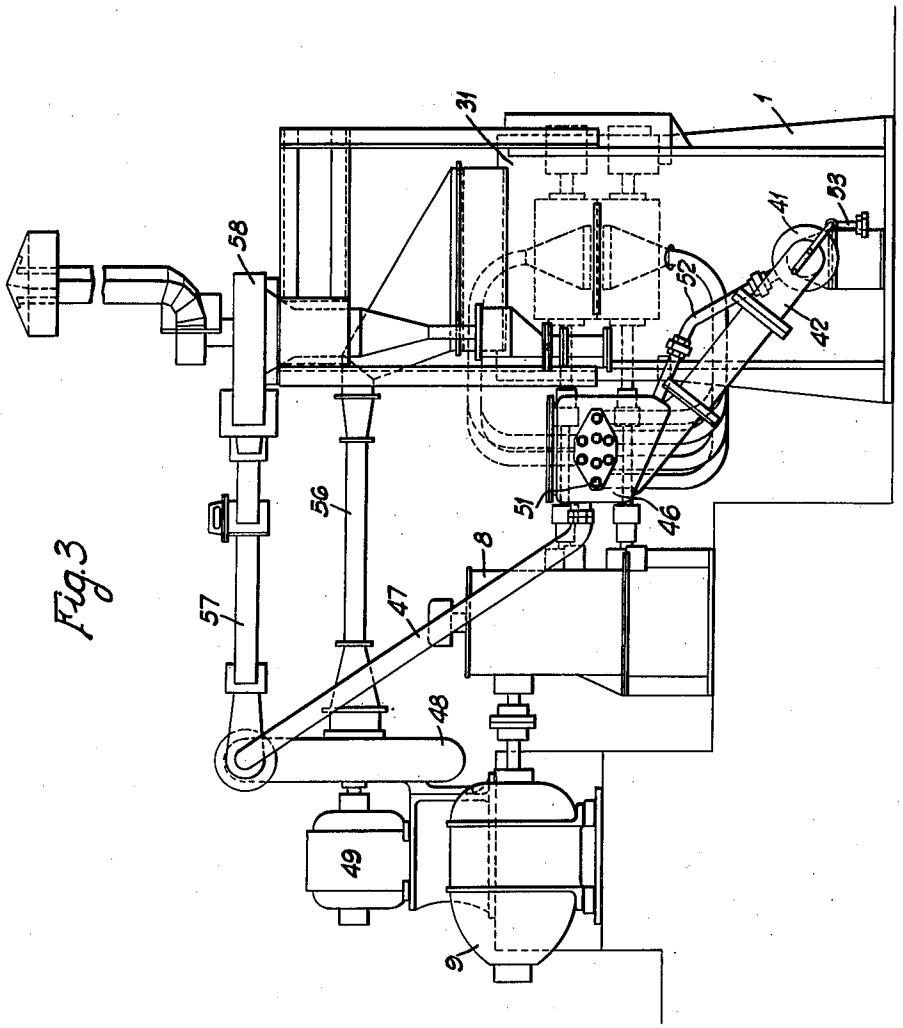


Fig. 3

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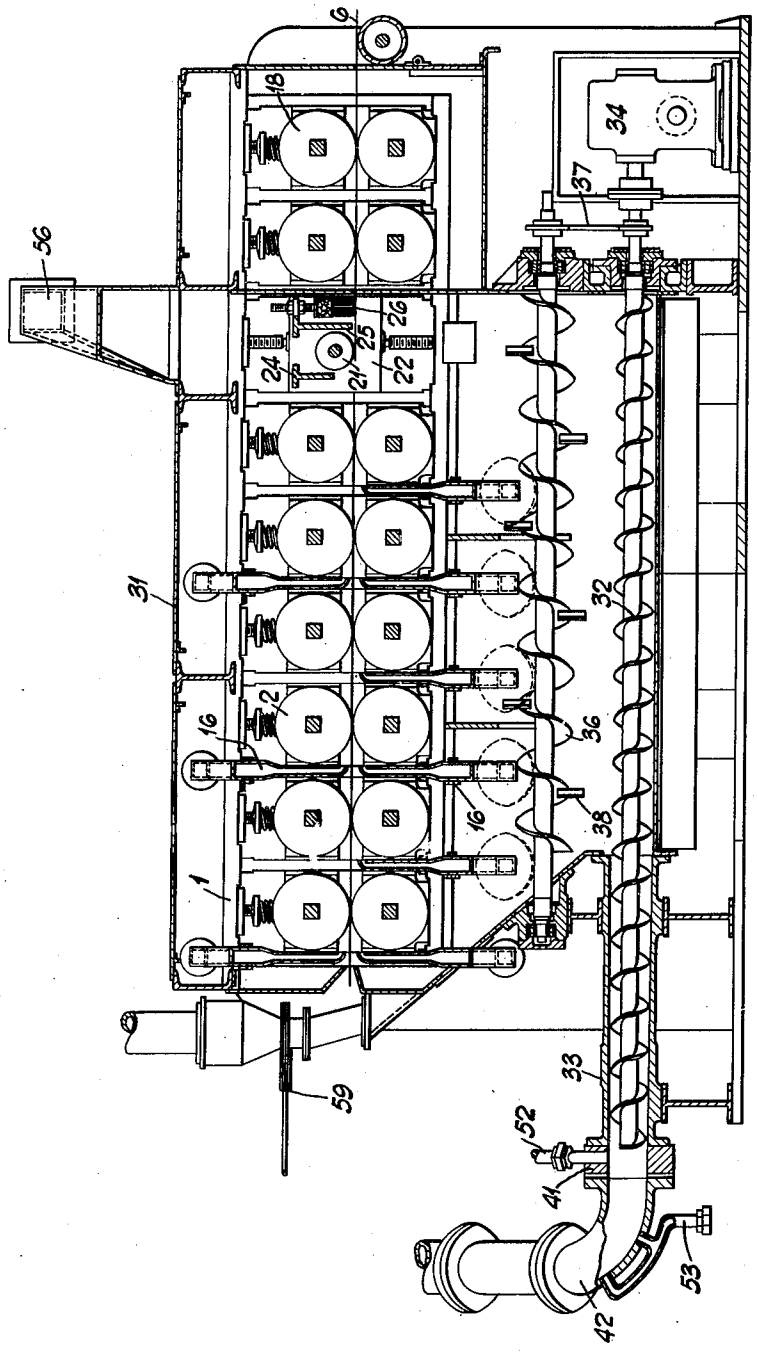


Fig. 4

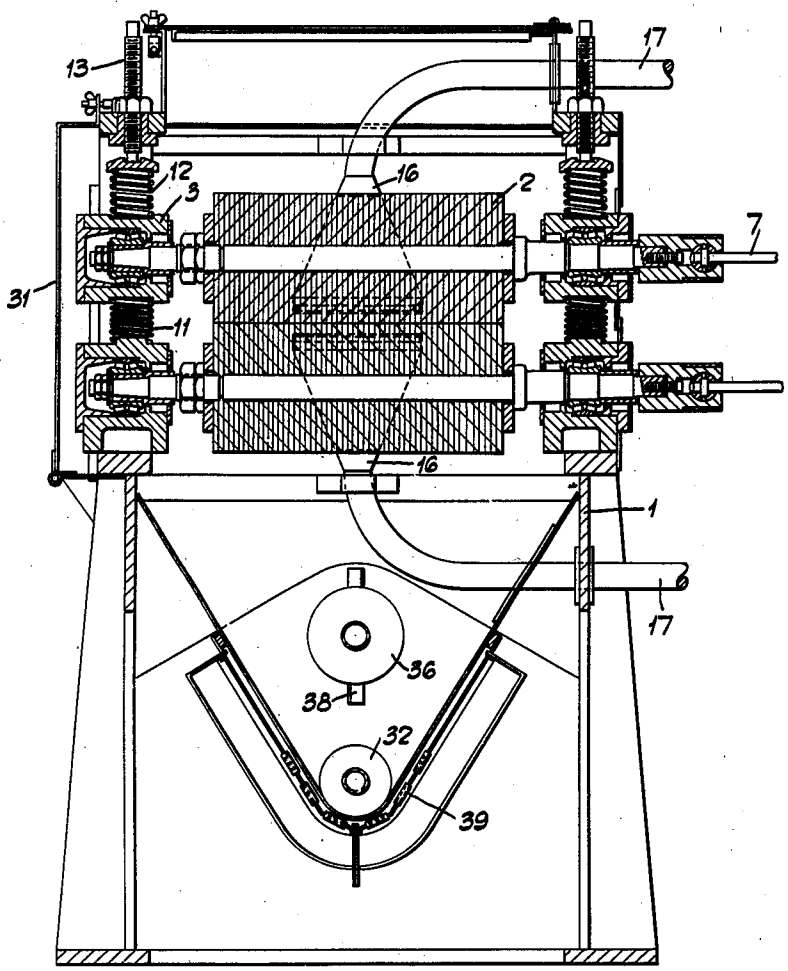
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Fig. 5



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UNITED STATES PATENT OFFICE

2,271,537

BRANNER

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Application August 3, 1940, Serial No. 350,481

19 Claims. (Cl. 51—23)

This invention relates to branning machines, and more particularly to machines of this character which are used for polishing and oiling electroplated metal strip, such as tin-plated steel or the like.

It has long been common practice to use bran or its equivalent for absorbing most of the oil adhering to the surfaces of metal plates as they leave a hot tinning bath. The bran, by serving as a mild abrasive, also helps the fabric polishing rolls to polish the plates. A more recent development is the application of the tin or other coating to the base metal by an electrodeposition process in which the material does not become coated with oil. In addition, it is becoming common practice to use this process for coating continuous metal strip rather than short plates. Branning machines that are used for cleaning and polishing plates are not suitable for use with metal strip, one reason being that they do not properly apply the bran to both surfaces of the strip. Although bran is used in both cases, it is desirable to use with electroplated metal, bran that has first been used for cleaning hot coated plates because such bran is oily and therefore applies enough oil to the electroplated metal to prevent it from rusting.

It is among the objects of this invention to provide a branning machine which is especially suitable for use with electroplated metal strip, which applies the bran satisfactorily to both surfaces of the strip, which cleans the bran from the strip before it leaves the machine, which confines the bran to the machine so that it does not leak out into the surrounding atmosphere, which is entirely automatic in its operation, and which maintains the bran at a temperature which permits it to readily give up some of its oil to the strip.

In accordance with this invention a plurality of polishing rolls are journaled in a closed housing for polishing both sides of metal strip passing continuously therethrough. Used bran, by which is meant oily bran or any other suitable material, is supplied to the rolls and strip in the housing by pneumatic means. To prevent the bran from being blown out of the housing into the atmosphere around it the air pressure inside of the housing is maintained less than that outside. Sufficient air is constantly withdrawn from the housing for this purpose and, preferably, some of this air is delivered to the conduits through which the bran is supplied to the rolls. The bran in the housing settles to its bottom from which it is withdrawn and delivered back to the bran-supplying conduits. Preferably, the withdrawing means comprises a pair of conveyor screws, one of which extends across the bottom of the housing and withdraws the bran from the front end thereof while the other one is journaled above it for carrying the bran from the front to the rear of the housing so that it will not pile up in the front portion thereof. After the strip has passed the polishing rolls the bran on its upper surface is positively removed, and the strip then passes between finishing rolls which increase the brightness of its finish.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which Fig. 1 is a plan view of my branning machine; Fig. 2 is a side view thereof; Fig. 3 is a view of the entry end; Fig. 4 is a vertical longitudinal section taken on the line IV—IV of Fig. 1; and Fig. 5 is a vertical transverse section taken on the line V—V of Fig. 2.

Referring to the drawings, a framework 1 supports a plurality or train of pairs of superimposed polishing rolls 2 the necks of which are journaled in chucks 3 removably mounted in a plurality of longitudinally spaced windows 4 in the opposite sides of the framework. The rolls are made of suitable metal polishing material, each preferably being formed from a plurality of axially aligned circular fabric disks as shown in Fig. 5. Metal strip 6 is drawn under tension continuously between the upper and lower rolls which are driven at a high rate of speed by spindles 7 from a gear box 8 to which power is supplied by an electric motor 9. To vary the pressure of the rolls against the strip the upper chucks, which, as shown in Fig. 5, are supported on coil springs 11, are pressed downwardly by coil springs 12 compressed between them and the lower ends of vertical adjusting screws 13 threaded in the top of the framework.

While the strip is passing between the rolls and being polished thereby, bran or an equivalent material is blown against the upper and lower surfaces of the strip by a plurality of vertical nozzles 16 disposed between the pairs of rolls. For this purpose, as shown in Fig. 4, a nozzle is located in front of each lower roll with its outlet directed toward the roll pass, but there need not be a nozzle beside each upper roll because bran will collect on the upper surface of the strip and pass from one pair of rolls to the next. Each nozzle has a long narrow outlet (Fig. 5) from which it tapers towards its inlet

that is connected to a pneumatic tube 17 through which bran is supplied to the nozzle in a manner to be described presently.

From the polishing rolls the strip passes between finishing rolls 18 (Fig. 4) that are mounted in framework 1 in the same manner as the other rolls and which impart a high luster or finish to the strip without the use of bran. The finishing rolls are made of softer material than the polishing rolls and are driven at a higher rate of speed. To remove the bran from the upper surface of the strip before it reaches the finishing rolls a clean-off screw 21 (Figs. 1 and 4) is journaled at its ends above the strip in vertically adjustable bearing blocks 22 slidably mounted in the sides of the framework, and is driven from one end by an eletric motor 23 (Fig. 1). To form something in the nature of a conduit for this screw to operate in, barrier plates 24 and 25 are mounted on both sides of the screw with their ends rigidly connected to bearing blocks 22. The bran piles up between these plates and is carried laterally over one edge of the strip by screw 21. However, the screw and barrier plates must be spaced a short distance from the strip to avoid scratching it, so to prevent a thin layer of bran from passing under plate 25 and reaching the finishing rolls a vertically adjustable brush 26 is connected to the last plate and engages the upper surface of the strip throughout its width. The bran that piles up against this brush may be blown off the strip by an air jet 27, indicated in Fig. 1.

To confine the bran to the machine the polishing rolls, nozzles, clean-off screw and brush are enclosed by a housing 31 supported by framework 1 and which has a hopper-like lower portion (Fig. 5) into which the bran falls from the strip. As shown in Fig. 4, journaled in the bottom of the hopper is a conveyor screw 32 that projects through the front wall of the hopper and into an outwardly extending tubular member 33. This screw is driven from its rear end outside of the housing by a power unit 34 so as to remove bran from the housing substantially as fast as it is blown into it by the nozzles. The thread of the screw is tapered from the front of the hopper toward its rear end so that it will bite into and carry the bran and not merely bore a hole through it. The bran is prevented from working into a pile toward the front of the housing by another conveyor screw 36 journaled above the lower screw and driven from its rear end from power unit 34 by a chain and sprocket drive 37. As the thread of screw 36 is wound in opposite direction from that of screw 32, bran is carried by it toward the rear of the housing and thereby more evenly distributed therein. The bran is mixed in the housing by paddles 38 attached at intervals to the thread of the upper conveyor screw. This agitation is especially desirable in order to facilitate heating of the pile of bran in the bottom of the housing, such as by electric heating elements 39 mounted against its lower portion, to keep the bran from caking and to insure that it will freely release oil for coating the strip.

Tubular member 33 is connected by a collar 41 to an elbow 42 that leads to the bottom of a casing 43 disposed at one side of the front end of the housing. As shown in Figs. 1 and 2, the inlet ends of all of the pneumatic tubes 17, which are connected to nozzles 16, project into this casing. Mounted in the casing wall opposite to the tubes are a plurality of jet members 44, one in axial alignment with each tube with their adjacent ends spaced apart. The outer or inlet ends of these jets open into a chamber 46 at the back of the casing which is connected by a conduit 47 with a blower 48 driven by a motor 49. Thus, air from the blower enters chamber 46 and passes out through jets 44 and into tubes 17. Air in casing 43 is entrained by the air streams between the jets and tubes and carried into the tubes, and this can be regulated by screwing the exteriorly threaded jets forward or backward in the casing wall. The amount of air supplied to the inlet of each jet can be controlled by valves in the form of bolts 51 threaded in the back wall of chamber 46 where their heads can be moved toward and away from the jet members.

Bran is delivered to casing 43 from the end of the lower conveyor screw 32 by air pressure, whereby the bran can be readily entrained with the air entering pneumatic tubes 17. For this purpose chamber 46 is connected by a pipe 52 to collar 41 so that some of the air that enters the chamber passes through it and mixes with the bran leaving the lower conveyor screw. This aerates the bran which is then readily caught up by air streams entering the elbow 42 from a pipe 53 connected to a suitable source of air under pressure. These air streams carry the bran into the casing and help feed it into the tubes. To prevent this air from blowing back into the bottom of the housing through tubular member 33, the thread of the lower conveyor screw at the inner end of the tubular member substantially fills that member and then tapers toward the front end of the screw. By this means a gasket-like core of bran is formed between the screw and tubular member.

Another feature of this invention is that the bran that is blown by the nozzles into the housing is prevented from sifting out of it into the surrounding atmosphere. Accordingly, the air pressure within the housing is maintained less than that outside of it so that air can leak only into it. To maintain this lower pressure in the housing it is provided in its top above the clean-off screw with an opening which is connected by a duct 56 to the inlet side of blower 48. Air is thus constantly withdrawn from the housing, and the blower is of such capacity and is operated at such a rate that it will maintain a negative pressure in the housing. Not all of this air can be fed back to the housing through the nozzles because that would prevent maintaining the negative pressure. Therefore, a second conduit 57 leads from the blower to the atmosphere, and an air cleaner 58 is connected to this conduit to prevent bran from escaping. The bottom of the air cleaner communicates with the inside of the housing, but communication is normally shut off by a valve 59. At suitable intervals of time this valve is opened to permit the bran that has accumulated in the cleaner to pass into the housing where it can again be used.

It will thus be seen that electroplated strip metal can be continuously polished and oiled in a very satisfactory manner by apparatus constructed in accordance with this invention, which is entirely automatic and requires no attention while in operation. The machine is clean to work around because the bran can not escape from it. The bran travels in a substantially closed circuit and therefore is used over and over again until it is no longer oily enough to oil the strip.

According to the provisions of the patent statutes, I have explained the principle and mode of

operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A branning machine comprising a pair of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a housing enclosing the rolls, and means for maintaining air pressure in the housing less than that outside of it whereby the bran does not leak out of the housing and into the surrounding atmosphere.

2. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, pneumatic means for supplying bran to the rolls, a housing enclosing the rolls, means for constantly withdrawing sufficient air from the housing to maintain the pressure therein less than atmospheric, and means for delivering some of the withdrawn air to said bran supplying means.

3. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, pneumatic means for supplying bran to the rolls, a housing enclosing the rolls, means for constantly withdrawing sufficient air from the housing to maintain the pressure therein less than atmospheric, and a conduit connecting said air withdrawing means and bran supplying means, said conduit being provided with an exhaust opening for the escape of some of said withdrawn air.

4. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, pneumatic means for supplying bran to the rolls, a housing enclosing the rolls, means for constantly withdrawing sufficient air from the housing to maintain the pressure therein less than atmospheric, a conduit connecting said air withdrawing means and bran supplying means, an air cleaner connecting said conduit with said housing and the atmosphere, and closure means between said cleaner and housing for normally shutting off communication between them.

5. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, a housing enclosing the rolls, a casing, means for supplying bran to the casing, conduits connecting the casing with the housing for supplying bran to the rolls, air jets disposed in said casing and associated with the conduits, means for constantly withdrawing sufficient air from the housing to maintain the pressure therein less than atmospheric, and means for conducting some of the withdrawn air to said jets whereby to aspirate the bran into said conduits.

6. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, a housing enclosing the rolls, a casing, means for supplying bran to the casing, conduits connecting the casing with the housing for supplying bran to the rolls, air jets disposed in said casing in line with the conduits with their inlet ends projecting out of the casing, a chamber enclosing said inlet ends, means for supplying air to said chamber whereby said jets aspirate the bran in said casing into said conduits, and means for conducting some of the air from said chamber to said bran supplying means.

7. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a housing enclosing the rolls, means for withdrawing bran from the housing and delivering it to said supplying means, and means for maintaining air pressure less than atmospheric in the housing whereby the bran does not leak out of the housing and into the surrounding atmosphere.

8. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a housing enclosing the rolls, a conveyor screw journaled in the lower portion of the housing for withdrawing bran therefrom through its entry end and delivering it to said supplying means, and a second conveyor screw journaled in the housing between said rolls and first screw for fluffing and conveying bran toward the strip delivery end of the machine.

9. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a housing enclosing the rolls, a conveyor screw journaled in the lower portion of the housing for withdrawing bran therefrom through its entry end and delivering it to said supplying means, the thread of said screw being tapered in diameter from said entry and toward its rear end in the housing and a second conveyor screw, having a plurality of paddles secured at spaced intervals thereto, journaled in the housing between said rolls and first screw for fluffing and conveying bran toward the strip delivery end of the machine.

10. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a housing enclosing the rolls, a tubular member projecting from the lower portion of the entry end of the housing, a screw conveyor rotatably mounted in said tubular member and extending into the housing for withdrawing bran therefrom, a conduit connecting the outer end of said tubular member with said bran supplying means, and means for introducing air under pressure into said conduit, the thread of the screw in said tubular member substantially filling the inner end of the member and tapering outwardly therefrom.

11. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, a plurality of nozzles having open lower ends between the upper rolls, a plurality of nozzles having open upper ends between the lower rolls, pneumatic means for supplying bran to said nozzles whereby it is blown against said rolls and strip, and a housing enclosing the rolls and nozzles.

12. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, and a screw conveyor journaled transversely of the strip in close proximity thereto beyond the last pair of polishing rolls for removing bran from the upper surface of the strip.

13. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a screw conveyor journaled transversely of the strip in close prox-

imity thereto beyond the last pair of polishing rolls for removing bran from the upper surface of the strip, a barrier member disposed transversely of the strip beside said screw between it and the delivery end of the machine, and means for adjusting said screw and barrier member vertically relative to the strip.

14. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a screw conveyor journaled transversely of the strip in close proximity thereto beyond the last pair of polishing rolls for removing bran from the upper surface of the strip, and a brush engaging and extending across the top of the strip adjacent the screw between it and the delivery end of the machine.

15. A branning machine comprising a pair of superimposed polishing rolls for polishing metal strip passing between them, pneumatic means for supplying bran to the rolls, a housing enclosing the rolls, a pair of superimposed finishing rolls disposed outside of the delivery end of the housing in tandem with the rolls therein for finishing the opposite surfaces of the strip, and means comprising a screw conveyor journaled transversely of the strip in close proximity thereto for removing bran from the strip before it leaves said housing.

16. A branning machine comprising rolls for polishing the opposite sides of metal strip, means for supplying bran to the rolls, a housing enclosing the rolls, means for withdrawing bran from the lower portion of the housing and delivering it to said supplying means, and means for heating the bran in the housing.

17. A branning machine comprising rolls for polishing the opposite sides of metal strip, means for supplying bran to the rolls, a housing enclosing the rolls and provided with a lower portion having downwardly converging side walls, means for heating said side walls, and means for withdrawing bran from said lower portion and delivering it to said supplying means.

18. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a housing enclosing the rolls, a conveyor screw journaled in the lower portion of the housing for withdrawing bran therefrom through its entry end and delivering it to said supplying means, a second conveyor screw journaled in the housing between said rolls and first screw for conveying bran toward the delivery end of the machine, means connected to said second screw for agitating and mixing the bran, and means for heating the bran in the housing.

19. A branning machine comprising a train of pairs of superimposed polishing rolls for polishing metal strip passing between them, means for supplying bran to the rolls, a housing enclosing the rolls, means for removing bran from the strip before it leaves said housing, a conveyor screw journaled in the lower portion of the housing for withdrawing bran therefrom through its entry end and delivering it to said supplying means, a second conveyor screw journaled in the housing between said rolls and first conveyor for conveying bran to the delivery end of the machines, means connected to said second screw for agitating and mixing the bran, and means for heating the bran in the housing.

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