April 21, 1964 E. THOMAS 3,129,712

CONTINUOUS SCALING DEVICE FOR METAL BANDS

Filed June 13, 1960 3 Sheets-Sheet 1

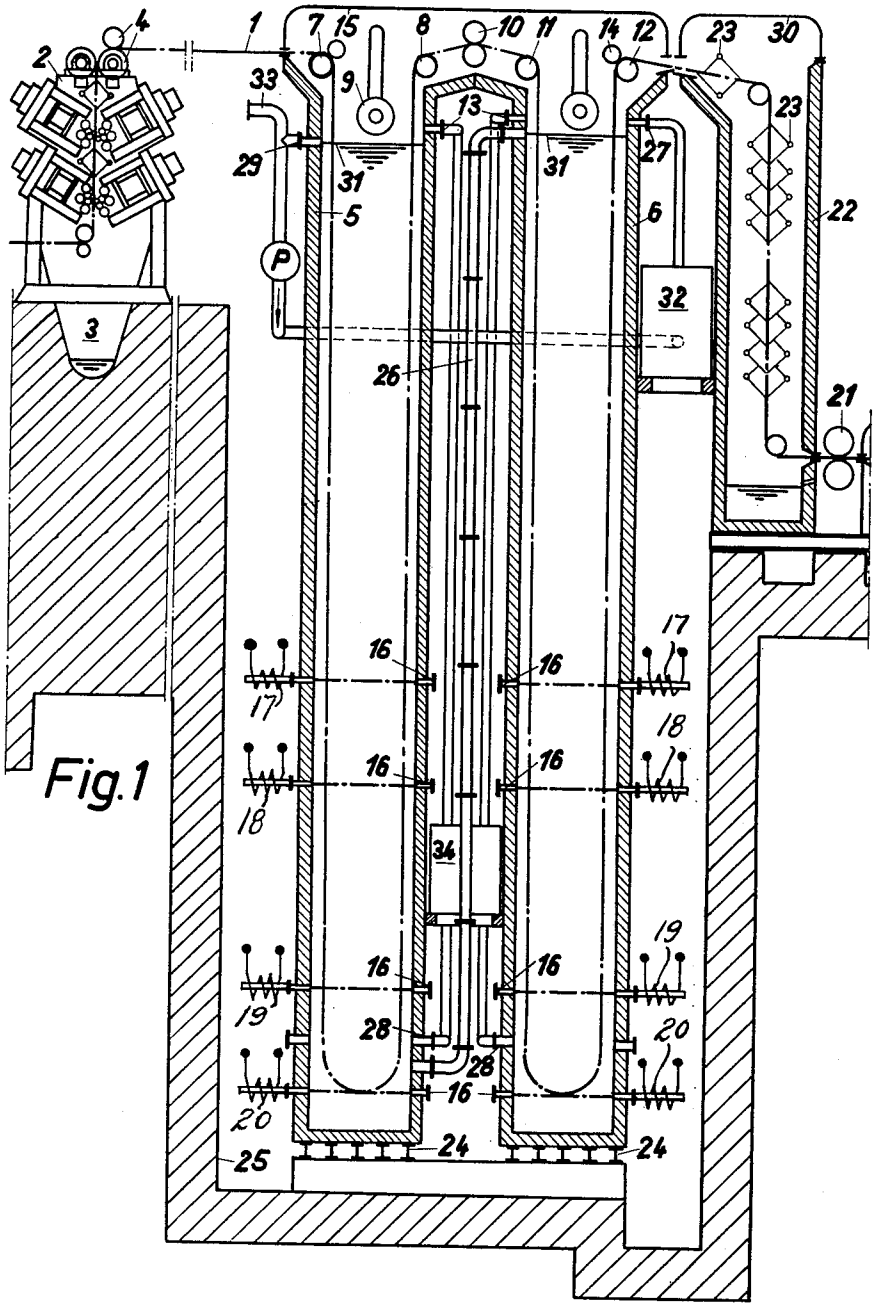


Fig. 1

Inventor:
Erich Thomas
By Grant & Montague
Attorney

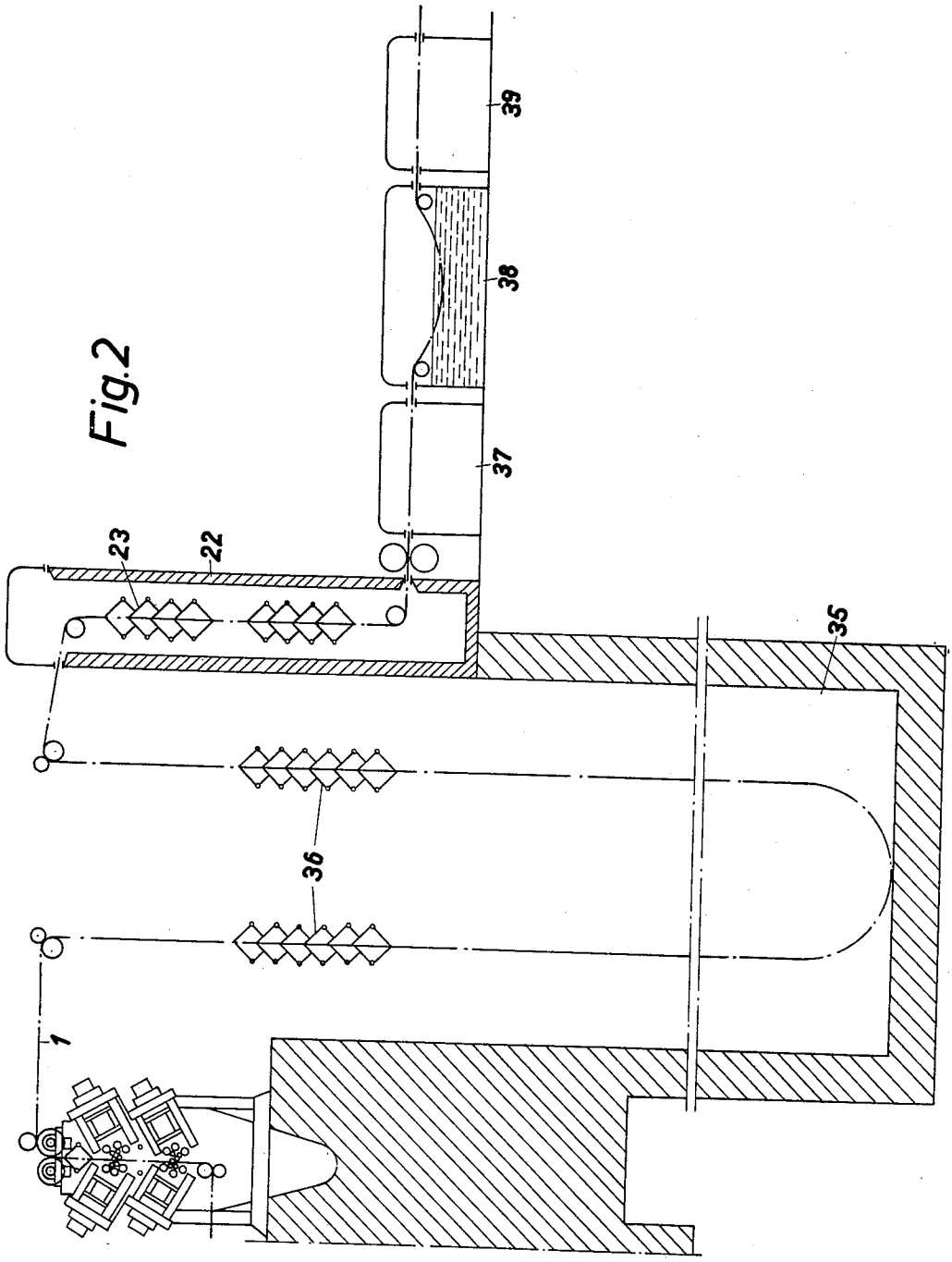
April 21, 1964 E. THOMAS 3,129,712

CONTINUOUS SCALING DEVICE FOR METAL BANDS

Filed June 13, 1960

3 Sheets-Sheet 2

Fig.2



Inventor:
Erich Thomas
By Ernest J. Montague
Attorney

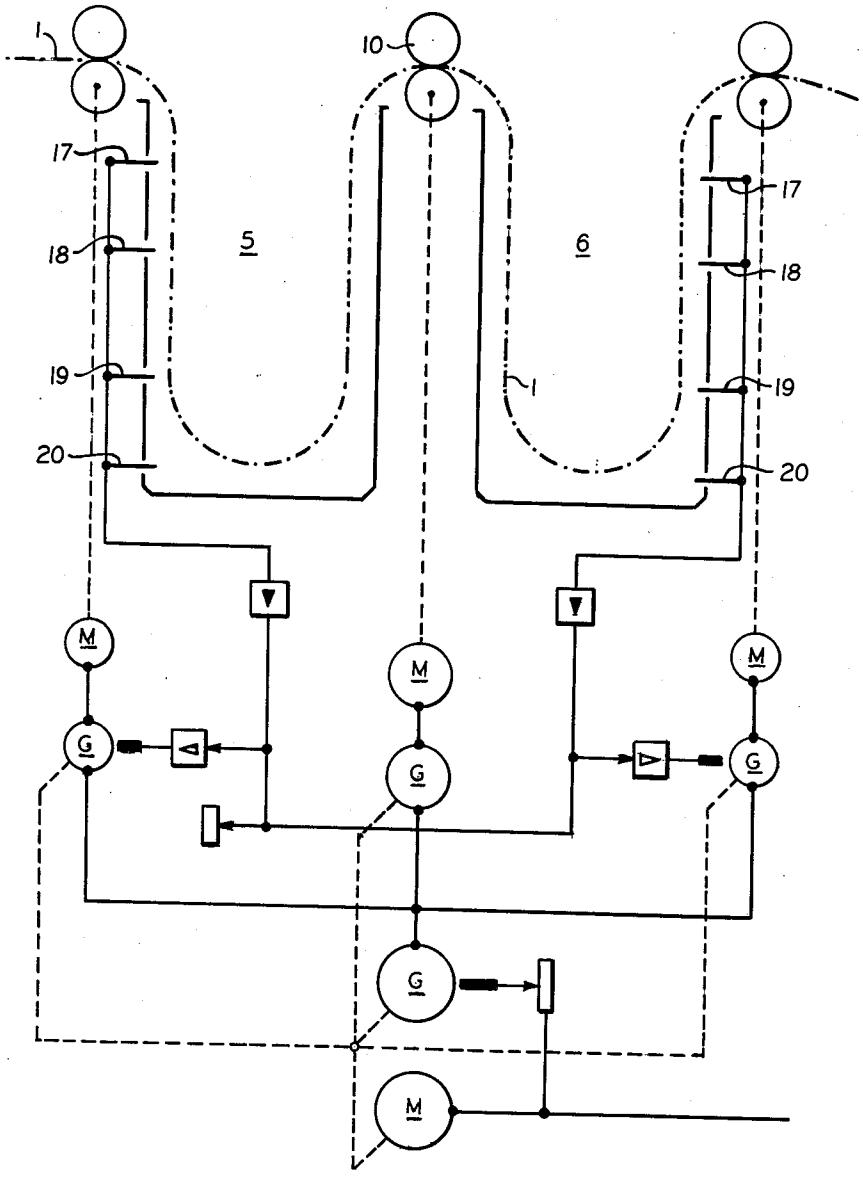
April 21, 1964 E. THOMAS 3,129,712

CONTINUOUS SCALING DEVICE FOR METAL BANDS

Filed June 13, 1960

3 Sheets-Sheet 3

FIG. 3.



INVENTOR
ERICH THOMAS
BY
ATTORNEY.

United States Patent Office

3,129,712

Patented Apr. 21, 1964

3,129,712

CONTINUOUS SCALING DEVICE FOR METAL BANDS

Erich Thomas, Essen, Germany, assignor to Beteiligungs- und Patentverwaltungsgesellschaft mit beschrankter Haftung, Essen, Germany, a corporation of Germany

Filed June 13, 1960, Ser. No. 35,645
Claims priority, application Germany June 18, 1959
5 Claims. (Cl. 134—57)

The present invention relates to a continuous scaling device for metal-bands. Devices are known, in which metal-bands, preferably of steel, are scaled by means of an acid.

In the first place, the scaling device aims to remove crust layers which are present on the metal-band. Scaling devices for metal-bands are known, by means of which the band to be scaled is of practically unlimited length and guided by means of a driving apparatus disposed always in front of and behind the scaling device, through flat, longitudinal extending containers filled with acid. The band is maintained under such pull, that the run of the band is of just such a speed, that the band is sufficiently immersed in the acid in each container. Such container arrangements require a very great length and, furthermore, the surface of the acid baths in the containers is likewise very great, so that a great amount of energy is required for heating of the acid and a large amount of acid vapors must be sucked off from the surfaces in the containers. The duration of the immersion in the acid of the band to be scaled may be controlled solely by a change of the band speed. If a band tears in one of the containers, the removal of the torn off pieces from the large container causes great difficulties.

It is, therefore, one object of the present invention to provide a continuous scaling device for metal-bands, wherein the drawbacks set forth above, are removed.

It is another object of the present invention to provide a continuous scaling device for metal-bands which includes a container which is filled with acid and extends in vertical direction, to receive a freely suspended loop of the band to be scaled.

The building length of the device is, thereby, measurably smaller than that of the known devices, and also the required land area and the necessary working hall is of smaller dimensions. The free surface of the acid bath and, thus, the evaporation is also measurably reduced and, thereby, also the heating required to be provided and the amount of the acid vapors to be sucked off. The duration of the immersion of the metal-band to be scaled in the acid bath is not only dependent upon the band speed, but also upon the length of the loop of the band freely suspended in the container.

It is still another object of the present invention to provide a continuous scaling device for metal-bands wherein a measuring apparatus is provided in at least one horizontal plane in the container, in order to determine the lengths of the loop of the band, by which measuring device it can be determined, whether the loop of the band projects through said horizontal plane, or beyond the level of the plane. Such measuring device may comprise, for instance, a light source and a photocell measuring the light emerging from the light source or an apparatus measuring the rate of the rays of a radioactive material disposed on the opposite side of the container. The apparatus can also respond to the change of an electric or magnetic field caused by the immersion of the loop of the band in the container. Suitably such devices are arranged in two adjacent horizontal planes, whereby these devices are connected with the driving apparatus in such a manner, that the loop is lengthened

if it does not reach into the upper of the horizontal planes, and wherein the loop is shortened if it reaches below the lower of the two planes. This can be brought about, for instance, while maintaining a constant speed for the driving apparatus, which feeds the band to the scaling device, by changing the speed of the driving apparatus which leads the band out from the device.

If such devices are disposed in the container in a plurality of horizontal planes, in which the immersion of the loop of the band can be determined, by corresponding switching, the length of the loop to be adjusted may be selected to any of these horizontal planes, and, thereby, at a constant speed of the band the duration of the immersion in the acid.

It is yet another object of the present invention to provide a continuous scaling device for metal-bands, which includes direction changing rollers disposed above the surface of the acid, over which rollers the direction of the band is changed, so that the loop of the band hangs through between two shifting rollers. If the band should tear once in the container, the two parts of the bands are simply pulled upwardly above the surface of the acid and again connected between the two shifting rollers. The shifting roller, over which the bands of the scaling device moves out, cooperates with a second roller disposed above the band in such a manner that the acid adhering to the surface of the band is squeezed off and returns to the acid bath along the vertically running band.

It is a further object of the present invention to provide a continuous scaling device for metal-bands wherein a plurality of containers is provided in series arrangement in order to avoid that the required depth of the acid bath is too great. Suitably the containers are disposed jointly in a shaft, whereby the depth of the shaft and the vertical height position of the container is suitably chosen.

Any suitable acid, for instance, hydrochloric acid and/or sulphuric acid can be used in the scaling device designed in accordance with the present invention. The advantages of the scaling device for metal-bands designed in accordance with the present invention are exploited even when, if the container is not filled with acid, the latter is sprayed towards the band in the container by means of spraying-nozzles. If the band is not to be immersed in an acid bath, and is to be sprayed with acid only, it is possible that the wall of the shaft will suffice in the place of the container.

With these and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings in which:

FIGURE 1 is a vertical section of a scaling device;

FIG. 2 is a vertical section of another scaling device according to the present invention; and

FIG. 3 is a circuit diagram indicating the electrical connections between the sensing elements and the drive rolls.

Referring now to FIGURE 1, the band 1 to be scaled runs at first vertically from below upwardly through a crust-breaker 2, in which the band 1 is cracked and sprayed with forceful water sprays. The water runs together with the broken-off crust into the trench or ditch 3. The driving apparatus 4 guides the band towards the scaling bath. A direction changing roller 7 is disposed above the acid level 31 in the container 5. Additionally, a second direction changing roller 8 is also provided. The band 1 hangs down into the container 5 in the shape of a loop between the two direction changing rollers 7 and 8. A vertically adjustable roller 9 is disposed between the direction changing rollers 7 and 8, by means of which roller 9 the band 1 may be pressed or pushed

at least to such a depth into the container 5 that it hangs down by its own weight upon proper further feeding in the shape of a loop in the container 5 if, for instance, it has been welded together between the direction changing rollers 7 and 8 and extends substantially horizontally between the direction changing rollers 7 and 8. The band 1 is pulled over the direction changing roller 8 by means of the driving apparatus 10 and runs from there over the direction changing roller 11, to form between the latter and the direction changing roller 12 an additional loop in the container 6 filled with acid. A squeezing roller 14 is disposed above the direction changing roller 12, which squeezing roller 14 cooperates with the direction changing roller 12 in such a manner that it squeezes off the acid adhering to the surface of the band 1. The containers 5 and 6 are covered by a common cap 15. Light sources are arranged at the containers 5 and 6 at different levels. Photocells 17, 18, 19 and 20, respectively, are disposed opposite a corresponding light source 16 always in a corresponding horizontal plane. If the loop of the band 1 extends into a horizontal plane between one of the light sources 16 and one of the corresponding photocells 17, 18, 19 and 20, respectively, the particular light ray is interrupted, so that by means of one of the light sources 16 and the corresponding one of the photocells 17, 18, 19 and 20, respectively, the depth of the loop of the band 1 in the containers 5 and 6, respectively, may be determined. The photocells 17, 18, 19 and 20, respectively, are operatively connected with the drive of the driving apparatus 21 and the photocells 17, 18, 19 and 20, respectively, are operatively connected in the container 5 with the drive of the driving apparatus 4, and in particular in the embodiment shown in the drawing in such a manner that the driving apparatus 21 increases the speed if the loop of the band 1 in the container 6 penetrates through the horizontal plane extending through the photocell 20, and that the driving apparatus 21 reduces its speed if the loop of the band is short of the horizontal plane extending through the photocell 19 in the container 6, as well as correspondingly that the driving apparatus 4 increases its speed if the loop of the band 1 is short of the horizontal plane extending through the photocell 19 in the container 5 and reduces its speed if the loop of the band 1 in the container 5 penetrates through the horizontal plane extending through the photocell 20, in which case the speed of the driving apparatus 10 remains constant. A spraying container 22 is provided adjacent the container 6, in which spraying container 22 the band 1 is sprayed with water from nozzles 23. The containers 5 and 6 stand in the shaft 25 on a bed of supports 24. The acid runs out from the container 6 from its surface through the conduit 26 into the container 5. Since the two containers 5 and 6 are in communication by means of the conduit 26, the level of the acid 31 is always at the same height in the containers 5 and 6. Either fresh acid or regenerated acid, which has been regenerated in a regeneration apparatus 32, is fed to the container 6 through the conduit connection 27. The acid is fed to the regenerating apparatus 32 through the conduit connection 29. The conduit joint 29 is simultaneously connected with an overflow 33, which prevents the acid level 31 from rising too high in the containers 5 and 6. Thus, an acid circuit is given by the two containers 5 and 6 and the regeneration apparatus 32, whereby the fresh and the regenerated acid, respectively, is fed to the container 6 and flows through the two containers 5 and 6 opposite to the direction of movement of the band 1, and whereby the used up acid is removed from the container 5. The two conduit joints 28 lead to a heater 34 operating by continuous passage, in which the acid is heated up and from which the acid is fed to the containers 5 and 6 by means of the conduit joint 13.

Another embodiment of the present invention is shown in FIG. 2, in which scaling device the band 1 does not run through an acid bath but is directly sprayed with acid by means of nozzles 36 in the pit 35. The band 1 first runs through a crust-breaker 2 and a driving apparatus 4. After leaving the pit 35 the band 1 runs through a spray container 22 in which container it is sprayed with water from nozzles 23 and finally the band 1 runs through another spray container 37, a hot water bath 38 and a drying oven 39.

The units shown in FIG. 2, viz. the second spray container 37, the hot water bath 38 and the drying oven 39 can be employed as auxiliary units arranged after a scaling device according to FIG. 1.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. A device for continuous scaling of a metal band comprising at least one longitudinal container adapted to be filled with acid and disposed in vertical direction and having side walls, a vertical shaft receiving said container, a driving apparatus disposed at the entrance and at the exit, respectively, of said container for feeding said metal band through said container, said metal band forming a loop hanging freely downwardly in said container, means forcibly guiding said loop downwardly into said container, measuring devices secured within said side walls of said container and protected by the inner surface of said side walls from the acid, as well as disposed vertically spaced apart from each other in planes at different levels and adapted to measure the length of said loop, said measuring devices including means for determination of passing said loop of said metal band through any one of said planes, and means connecting operatively said measuring devices with said driving apparatus.

2. The device, as set forth in claim 1, wherein said determination means comprises a light source disposed inside of said container and directing light rays to the opposite side of said container and a photocell, the latter being disposed in said container opposite said light source in said horizontal plane.

3. The device, as set forth in claim 1, wherein said determination means comprises a radioactive material disposed inside of said container in said horizontal plane and a member responsive to rays given by said radioactive material and disposed opposite said radioactive material in said container.

4. The device, as set forth in claim 1, wherein said determination means comprises means creating an electric field in said horizontal plane within said container and means responsive to a change in said electric field.

5. The device, as set forth in claim 1, wherein said determination means comprises means creating a magnetic field in said horizontal plane within said container and means responsive to a change in said magnetic field.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 20,673	Meyer	Mar. 15, 1938
1,544,506	Tytus	June 30, 1925
1,932,105	Hinnekens	Oct. 24, 1933
2,234,593	Ferm	Mar. 11, 1941
2,348,232	Trautman	May 9, 1944
2,405,157	McKee	Aug. 6, 1946
2,422,651	Ayers	June 24, 1947
2,448,835	Schefe	Sept. 7, 1948
2,661,009	Dunnegan	Dec. 1, 1953
2,708,445	Manson	May 17, 1955
2,907,565	Sauter	Oct. 6, 1959
2,960,963	Shelton	Nov. 22, 1960
2,979,933	Gaino	Apr. 18, 1961