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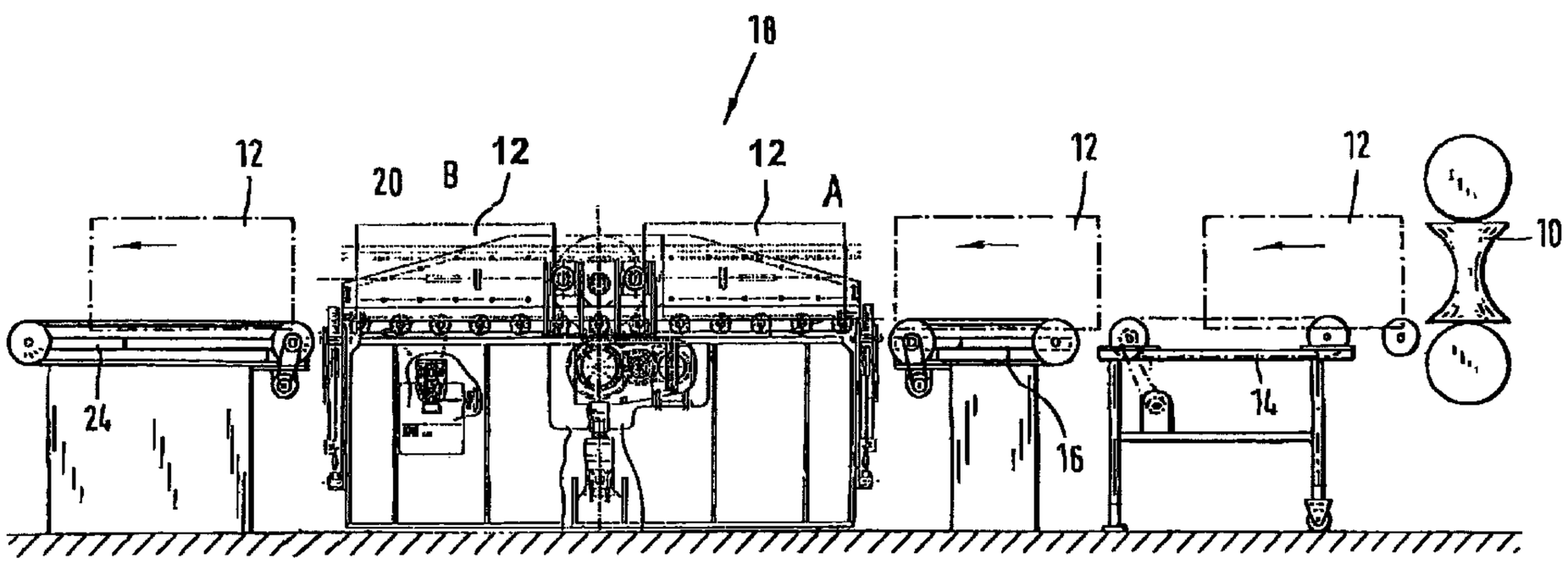
(54) **MACHINE DE LAMINAGE**
(54) **ROLLING MACHINE**



(57) The invention relates to a rolling machine for working a metal container having a longitudinal seam, especially a sheet steel container, in which a cylindrical body is bent out of a flat metal plate and the adjacent edges of the cylindrical body can be welded to one another, after which a discoid underside and, optionally, a corresponding top side are welded to the cylindrical body (=intermediate product) in order to form a closed container or a container which is open at the top. The problem posed by this method is that the inner welded seam edge is often depicted as the cause of early rust formation which results in the contamination of the filling item. According to the invention, the rolling process is carried out in a continuous rolling machine (18) in which a body (12) is loaded into the one station (=loading position A) and a finished body (12) is simultaneously unloaded in the other station (=unloading position B). To this end, the top inner roller supporting part (26) is centrally mounted. During the rolling process, the rolling device is mounted on the exterior. The distinctive feature of the continuous rolling machine (18) is in the, so to speak, "floating in an alternating manner" bearing of the top roller supporting part, i.e. it is equipped with an alternating locking device or fixing bearing which is placed centrally and on the exterior.

ABSTRACT

The invention relates to a rolling machine for working a metal container having a longitudinal seam, especially a sheet steel container, in which a cylindrical body is bent out of a flat metal plate and the adjacent edges of the cylindrical body can be welded to one another, after which a discoid underside and, optionally, a corresponding top side are welded to the cylindrical body (=intermediate product) in order to form a closed container or a container which is open at the top. The problem posed by this method is that the inner welded seam edge is often depicted as the cause of early rust formation which results in the contamination of the filling item. According to the invention, the rolling process is carried out in a continuous rolling machine (18) in which a body (12) is loaded into the one station (=loading position A) and a finished body (12) is simultaneously unloaded in the other station (=unloading position B). To this end, the top inner roller supporting part (26) is centrally mounted. During the rolling process, the rolling device is mounted on the exterior. The distinctive feature of the continuous rolling machine (18) is in the, so to speak, "floating in an alternating manner" bearing of the top roller supporting part, i.e. it is equipped with an alternating locking device or fixing bearing which is placed centrally and on the exterior.

ROLLING MACHINE

The invention relates to a rolling machine for processing a metal container with a longitudinal seam, in particular a sheet steel container, in which a cylindrical body is bent from a flat metal plate and has adjacent or overlapping butt edges which are securely joined to one another by folding or welding, whereupon a disk-shaped lower bottom and, optionally, a respective upper bottom, is welded or folded with the cylindrical body (= intermediate product) to a closed or to an open-topped container. The problem of conventional steel drums resides in the fact that the inside welding seam edge is oftentimes cause for premature rust formation and contamination of the contents. It is therefore desirable to flatten and to smooth the welding seam and the overlapping material zone, respectively, thereby, e.g., permitting a continuously closed application of a paint coat and substantially preventing the formation of rust clusters, in particular in the container interior, along the welding seam.

Such a rolling machine is described and explained in detail in German Pat. No. DE 196 37 107 A1. Hereby, a rolling drum is secured on the outside to a free cantilevered arm. This arm has to absorb great forces and thus is configured of substantial size to prevent flexure. In order to enable a continuous production, the cantilevered arm is rotatably supported whereby disadvantageously great masses need to be moved in short time intervals.

It is an object of the present invention to provide a novel rolling machine for processing metal containers with longitudinal seams, which realizes high production speeds, without requiring a swinging or rotating of large machine components (no moving masses).

This object is attained in accordance with the invention by configuring the rolling machine as linear continuous rolling machine in which the upper roll carrier part for work on the inside surface of the body is supported in a so-called "floating" manner, i.e. equipped with an alternating central and respectively external lock with respect to the lower frame stand.

As the result of the rolling process across the entire body length and along the entire longitudinal welding seam or folding seam of the container, respectively, the adjacent or overlapping butt edges of the cylindrical body (= envelope) are pushed shut (filled) in the area of the longitudinal welding seam and the rebounding gusset zone inside as well as outside along the overlapping end edges through material displaced laterally in circumferential direction by the rolling process, and disappear. As a consequence, easy application of paint, in particular the interior painting, or of a powder coating is ensured even in this otherwise very critical zone. Through the provision over a smooth, continuous paint coat, the area of the welding seam or fold is no longer recognizable and the above-stated drawbacks are eliminated.

The transport or the forward motion of the sheet metal envelope in the welding machine is typically realized by a corrugated feed roller which engages in the area of the overlap region. During passage of the rollers, the individual corrugations are pressed into the material to create an unsightly fluting. By smoothing the area of the longitudinal seam of the sheet metal envelope in accordance with the invention, also this fine fluting disappears.

In accordance with the invention, the overlapping wall area of the cylindrical envelope is rolled flat along the longitudinal seam of a longitudinally welded container from about twice the strength at least to 1 ½ of the strength or to the normal single strength of the metal plate or to the wall strength of the body. Thereby, the rolling process suitably follows directly the welding procedure at still elevated temperature of the material of the longitudinal seam area to be rolled, thereby smoothing all uneven zones. In particular in conjunction with large-volume containers, such as e.g. a 220 liter steel drum with a drum wall height or welding seam length of approximately 900 mm, smoothing of the longitudinal seam results in a substantial improvement of the product quality.

Further advantageous embodiments of the present invention are set forth in the sub-claims.

An exemplified embodiment of the invention will now be described in more detail with reference to the drawing, in which:

FIG. 1 is an overall view of the arrangement for rolling longitudinal seams of bodies;

FIG. 2 is a side view of the continuous rolling machine;

FIG. 3 is a front view of the rolling machine;

FIG. 4 is a cross section centrally through the rolling machine at the rolling drums; and

FIG. 5 is a cross section in the area of the drive for the conveyor rollers.

Reference numeral 10 designates in FIG. 1 a schematically depicted automatic welding machine from which the bodies 12, which have just been longitudinally welded, exit and are transferred to a separate discharge conveyor 14. The bodies 12 are transported by the discharge conveyor 14 to a separate transfer conveyor 16 by which the individual bodies 12 are transported into the actual rolling machine 18. The discharge conveyor 14 normally runs at the same conveyance speed as the automatic welding machine 10 whereas the bodies 12 can be temporarily stopped on the transfer conveyor 16 and accelerated again for loading the rolling machine 18. The conveyors 14, 16 are hereby equipped with respective drive motors. The rolling machine 18 for the longitudinal seam (= longitudinal seam smoothing machine) is here configured as high-performance

continuous rolling machine, as shown, on an enlarged scale, in FIG. 2. The inlet side is designated with A (= loading position), and the outlet side is designated with B (= unloading position). The rolling machine 18 includes a lower rolling machine stand 28 and an upper roll carrier part 26. The upper roll carrier part 26 is, so to speak, "floatingly supported", i.e. during incoming of a new, not yet rolled, body 12 onto the forward part of the upper roll carrier part 26 (= loading position A) and simultaneous exiting of a finished body 12, which has been rolled just now, from the rear part of the upper roll carrier part 26 (= unloading position B), the upper roll carrier part 26 is temporarily securely connected with the lower drum stand 28 via laterally engaging locking pins 30. As soon as the loading/unloading process is over, with only one drum body being positioned in the loading station A, the upper roll carrier part 26 is temporarily securely connected with the lower drum stand 28 externally via inwardly swingable locking claws 32. At the same time, the central locking pins 30 return in proximity of the pair of rolling drums 20, 22, and the upper roll carrier part 26 is clear across its entire length for the rolling process to be executed now, whereby the body 12 is conducted from the loading station A via the now operative pair of rolling drums 20, 22 into the unloading position B, thereby rolling the longitudinal welding seam flat. The lower rolling drum 22, which is operated by a rotary drive 46, is hereby moved upwards by a hydraulic unit 44 and pressed against the longitudinal weld of the body 12 and against the upper rolling drum 20 supported from inside.

The continuous rolling machine 18 is suited to the automatic welding machine to

run in 4.5 seconds clock cycle. This means, a new body 12 is introduced within 4.5 seconds on the (right) loading side A by the transfer conveyor 16 into the rolling apparatus 18 and a finished body 12 that underwent a rolling process exits the rolling machine 18 at the unloading zone B. After changing from the central lock to the external lock of the upper roll carrier part 26, the currently loaded body 12 is moved via the central pair of rolling drums 20, 22 to the opposite side = unloading position B of the rolling apparatus 18 and thereby rolled. Hereby, the following process steps are executed in sequence:

The lower rolling drum 22 is moved upwards in rolling position by the hydraulic unit 44 by a small portion (e.g. 50 mm) to the operative position and is driven by a rolling drum motor 46; the body 12 being processed is pushed ahead to both rolling drums 20, 22 and advanced through both rolling drums 20, 22 or the rolling gap therebetween, thereby carrying out the actual smoothing or rolling action. As soon as the smoothed body has passed the rolling drums 20, 22 and reached the unloading position, the central lock of the upper roll carrier part 26 is activated again, and the external lock with the inwardly and outwardly swinging locking claws 32 is released again, so that a new body can be introduced and the finished body can be discharged by means of a simple roller-type conveyor mounted on top of the lower drum stand 28 and including several rubberized rollers 34 driven by a drive motor 38 via a chain 36.

FIG. 3 shows a front view of the upper roll carrier part 26, depicting the locking

claws 32 swung inwardly by hydraulic cylinders 42 and temporarily supporting and locking the upper roll carrier part 26 with respect to the lower frame stand 28.

FIG. 4 shows a central cross section through the rolling machine in the area of the pair of rolling drums 20, 22. The lower rolling drum 22 is hereby not yet moved upwards by the hydraulic unit 44 and thus not yet in operative position. The central locking pins 30 are hereby not yet in operative position; the upper carrier frame 26 is supported and secured at this point in time on its outer ends by the locking claws 32 (not visible here) engaging from outside.

FIG. 5 shows essentially the roller-type conveyor, including the rollers 34, chain 36 and drive motor 38, for the linear transport of the bodies 12 inside the rolling machine. The advancing bodies 12 are additionally supported and guided by support rollers 40 acting from outside. Also shown here are the laterally engaging locking pins 30, which are activated by small hydraulic cylinders.

Exemplified Embodiment: The illustrated, continuous smoothing apparatus according to the invention for drum bodies is capable of rolling or smoothing at a clock time of about 4.5 seconds up to 800 bodies per hour. The body length that is capable of being processed for a 220 liters steel drum amounts to approximately 900 to 1100 mm at a body diameter of about 575 mm.

Bodies of different sheet metal thickness of e.g. 0.8 mm, 1.0 mm, 1.2 mm or

1.5 mm can be processed.

The overlap area along the longitudinal welding seam has a width of about 3 mm. Thus, the body has about twice the wall strength before the rolling process. After the rolling process, the body is rolled flat or down in the overlap area to almost single, i.e. normal wall thickness.

The bodies could also be designed with slight taper for another product, e.g., stackable lidded drums (= wide-necked packing drums). In this case, it is only necessary to correspondingly adjust the roller guide for the longitudinal transport of such conical drum bodies.

LIST OF REFERENCE NUMERALS

10 automatic welding machine for longitudinal seam

12 body (cylindrical sheet metal envelope)

14 discharge conveyor

16 transfer conveyor

18 rolling machine (continuous)

20 upper rolling drum

22 lower rolling drum

24 transport conveyor

26 upper roll carrier part

28 bottom stand/frame

30 central locking pins

32 external locking claws

34 running rollers

36 chain

38 motor for running rollers

40 support rollers

42 hydraulic cylinder (32)

44 hydraulic unit (22)

46 motor for rolling drums

A loading position (= inlet side)

B unloading position (= exit side)

CLAIMS

1. Rolling machine for processing a metal container with a longitudinal seam, in particular a sheet steel container, in which a cylindrical envelope is bent from a flat metal plate and has adjacent or overlapping butt edges which are securely joined to one another by folding or welding, whereupon a disk-shaped lower bottom and, optionally, a respective upper bottom, is welded or folded with the cylindrical envelope (= body) to a closed container such as e.g. a bunged drum, or an open-topped container such as e.g. a lidded drum, with the adjacent or overlapping butt edges of the cylindrical body being subject to a rolling process across the entire body length in the area of the longitudinal folding seam or longitudinal welding seam after the folding process or after the welding process and prior to the attachment of the lower bottom or/and the upper bottom,

characterized in that

the rolling machine is configured as continuous rolling machine (18), with the upper rolling drum (20) being rotatably supported in an upper roll carrier part (26), and the lower rolling drum (22) is rotatably and driveable in a lower drum stand (28).

2. Rolling machine according to claim 1,

characterized in that

the pair of rolling drums (20, 22) has a comparably slender configuration, with the lower rolling drum (22) having a concave outer rolling surface, and the upper rolling drum (20) having a corresponding convex outer rolling surface.

3. Rolling machine according to claim 1 or 2,

characterized in that

the lower rolling drum (22) with the concavely shaped rolling surface is arranged in the lower drum stand (28) and vertically displaceable by means of a hydraulic unit (44) as pressure-applying device, and equipped with a rotary drive (46) for the rolling drums.

4. Rolling machine according to claim 1, 2 or 3,

characterized in that

the upper rolling drum (20) is arranged centrally in the upper roll carrier part (26).

5. Rolling machine according to claim 1, 2, 3 or 4,

characterized in that

the upper roll carrier part (26) has laterally of or in front of the rolling drum (20) a loading position A in which a new body (12) can be charged by means of driven running rollers (34), and on the other side or behind the rolling drum (20) an unloading position (B) from which a finished, rolled body is discharged at the same time by means of driven running rollers (34).

6. Rolling machine according to at least one of the preceding claims 1 to 5,

characterized by

a configuration as continuous rolling machine (18), in which the upper roll carrier part (26), working on the inside surface of the body, is supported, so to speak, in a "floating" manner, i.e. equipped with an alternating central or external lock engaging on both outer ends.

7. Rolling machine according to at least one of the preceding claims 1 to 5,

characterized in that

the upper roll carrier part (26) is in locked engagement during the rolling process at both its outer sides with the lower rolling machine stand (28) by means of inwardly and outwardly swingable locking claws (32).

8. Rolling machine according to at least one of the preceding claims 1 to 7, **characterized in** that

the roll carrier part (26) is in locked engagement in the center with the lower rolling machine stand (28) by means of outwardly engaging locking pins (30) during loading of a new unrolled body and during discharge of the finished, rolled body.

9. Rolling machine according to at least one of the preceding claims 1 to 8, **characterized in** that

the interacting rolling drums (20, 22) are arranged at the lower rolling machine stand (28) and at the upper roll carrier part (26) in a central location of the continuous rolling machine (18), with the upper carrier part (26) having a length sufficient to receive at least one body envelope in front of and behind the upper rolling drum (20).

10. Rolling machine according to at least one of the preceding claims 1 to 9, **characterized in** that

the lock of the upper roll carrier part (26) in its central zone is implemented with respect to the lower rolling machine stand (28) via a total of four, i.e. on each side two directly next to the bearing of the upper rolling drum (20), locking pins (30) laterally engaging from outside and actuated, e.g. by means of small hydraulic cylinders.

11. Rolling machine according to at least one of the preceding claims 1 to 10, **characterized in** that

the external lock of the upper roll carrier part (26) is implemented with respect to the lower rolling machine stand (28) via laterally inwardly swingable locking claws (32) which are equipped with a hydraulic drive (42).

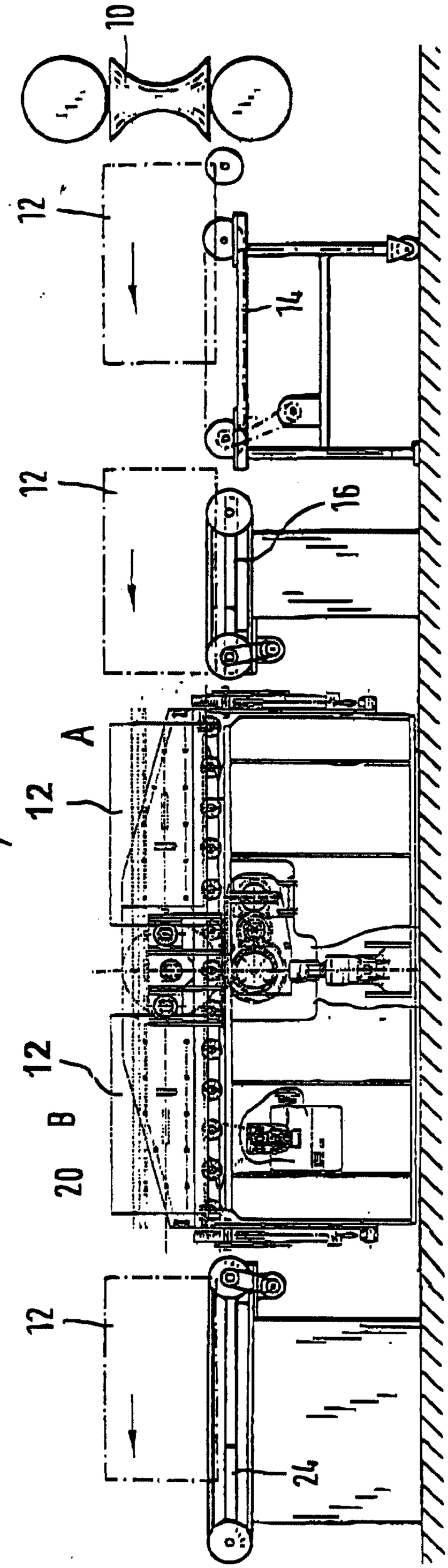


FIG.1

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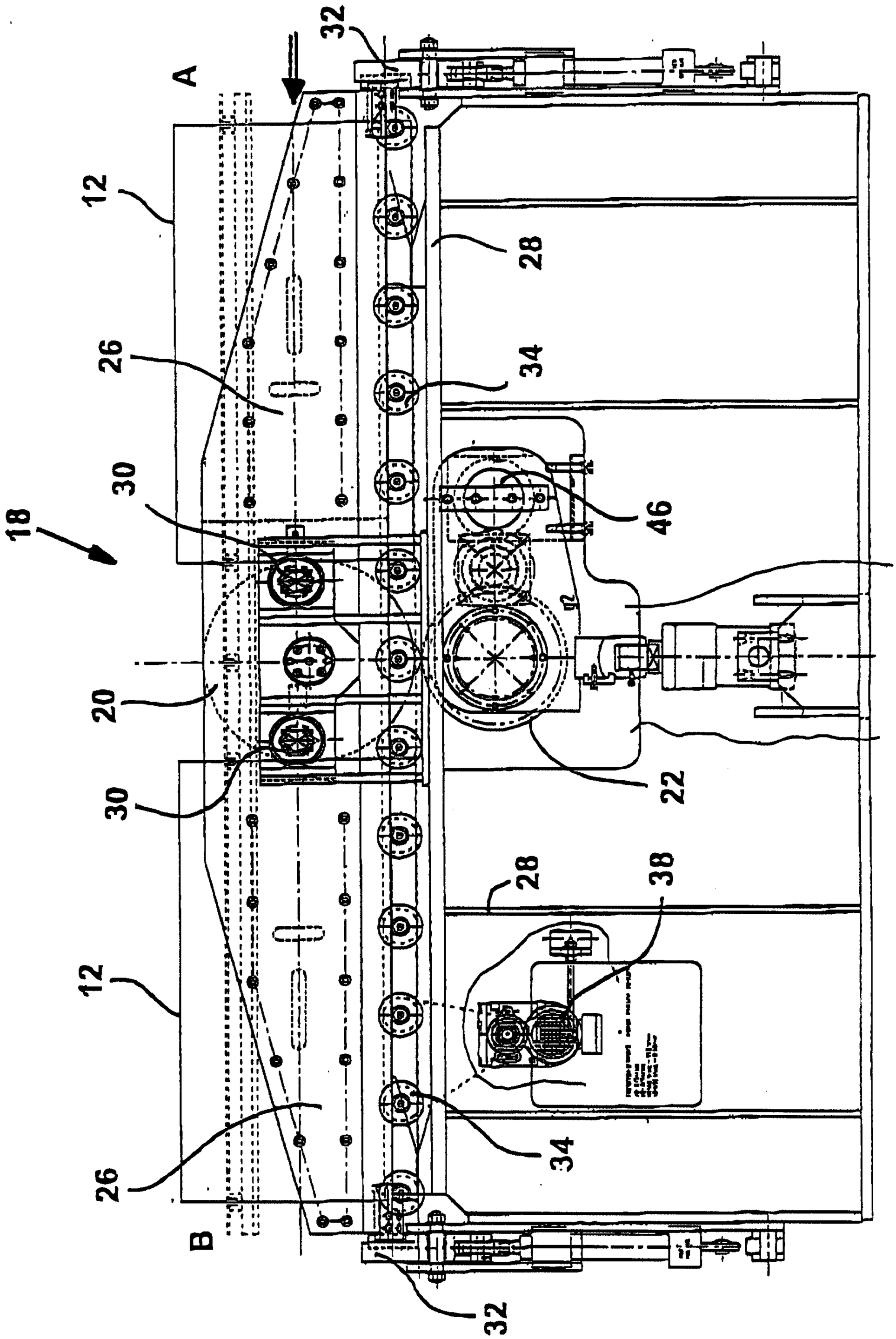

FIG. 2

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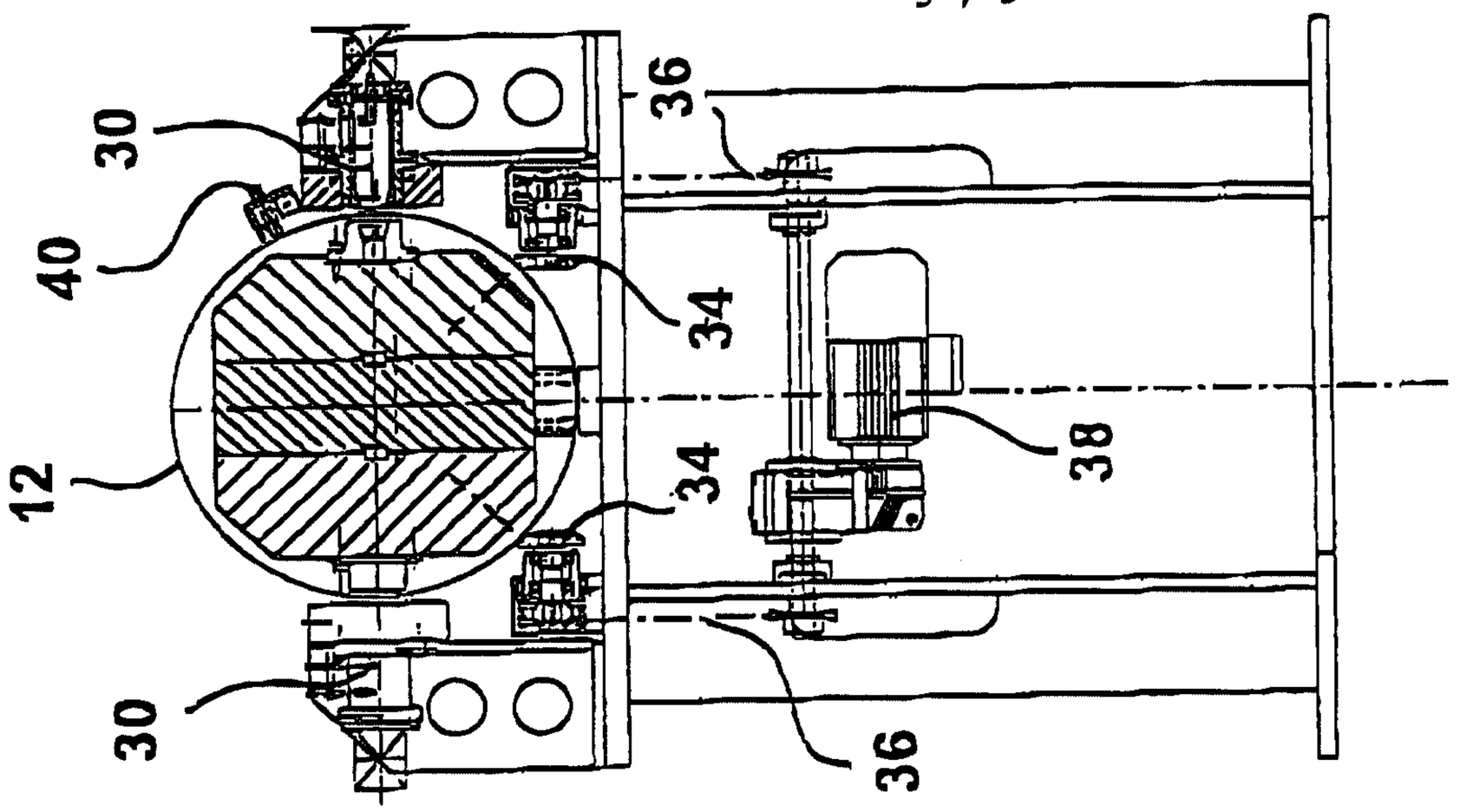

FIG.5

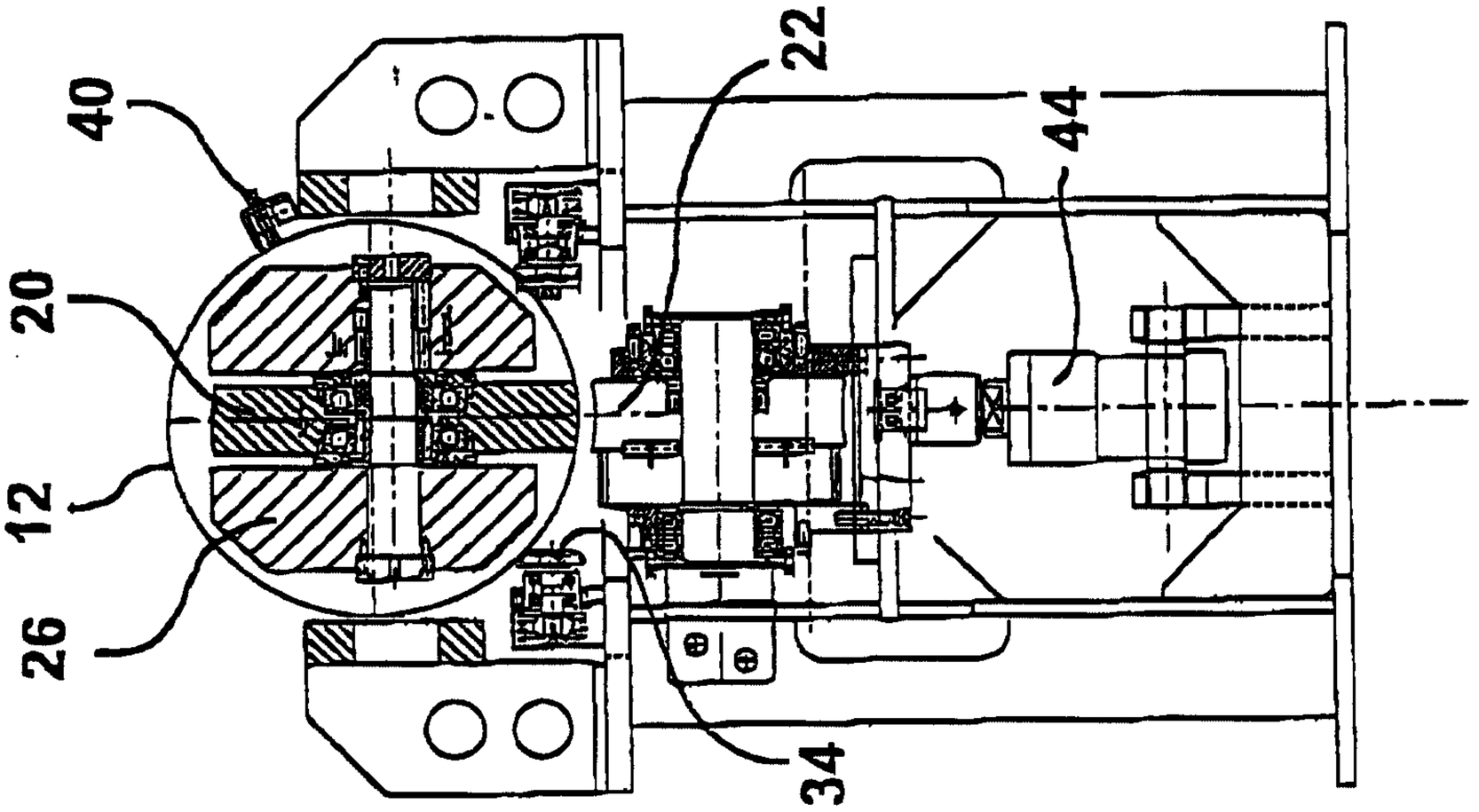

FIG.4

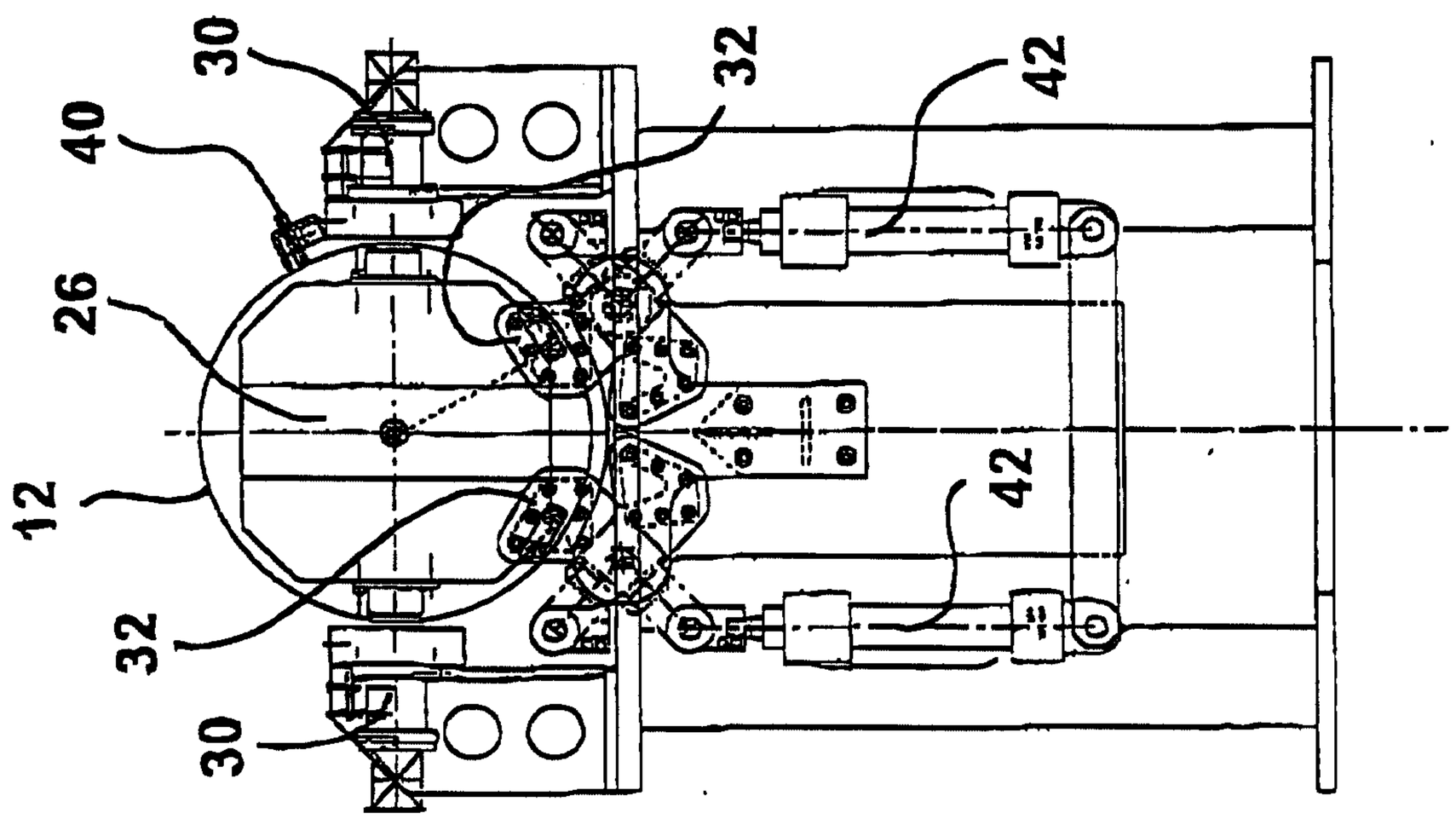

FIG.3

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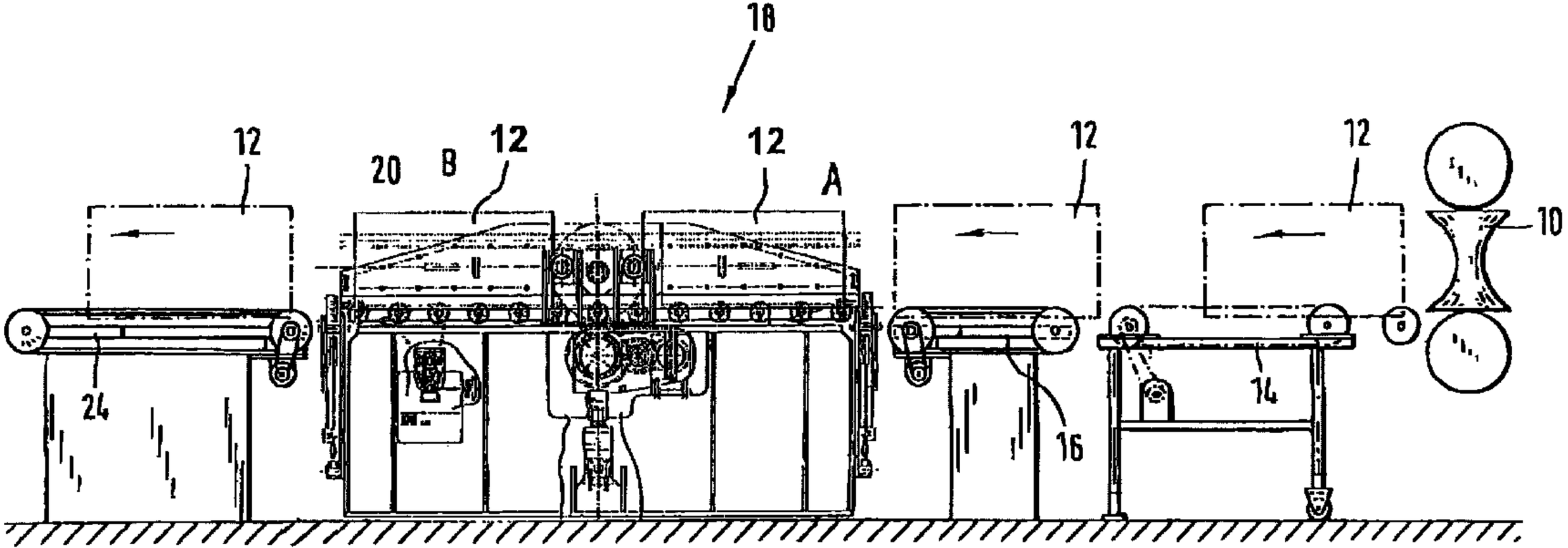
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