

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 338 144 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **17.06.92** (51) Int. Cl.⁵: **B08B 9/02, B21D 3/08**

(21) Application number: **88303485.2**

(22) Date of filing: **18.04.88**

(54) **Apparatus for cleaning and straightening a tubular article.**

(43) Date of publication of application:
25.10.89 Bulletin 89/43

(45) Publication of the grant of the patent:
17.06.92 Bulletin 92/25

(84) Designated Contracting States:
DE FR GB IT NL

(56) References cited:
DE-B- 1 004 018
DE-C- 391 450

(73) Proprietor: **NISSO SANGYO CO LTD**
1-10-1 Kakigara-cho
Nihonbashi Chuo-ku Tokyo(JP)

(72) Inventor: **Enoki, Takahiro**
2045-12 Horiuchi Hayama
Miura Kanagawa(JP)
Inventor: **Masuda, Akira**
815 Shinmatsudo-haitsu 743
Ohyaguchi Matsudo-shi Chiba(JP)

(74) Representative: **Cook, Anthony John et al**
D. YOUNG & CO. 10, Staple Inn
London, WC1V 7RD(GB)

EP 0 338 144 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

The present invention relates to an apparatus for cleaning and straightening a tubular article such as a tube forming a support post or a scaffolding tube which is used in building construction or other construction work. More particularly, the invention is concerned with such apparatus for removing concrete off the tubular article and for straightening a bent tubular article.

Generally, in building construction or in other construction work, a large number of support posts or tubes are used for scaffolding, and many of the tubes are subject to the problems: that concrete is attached to the peripheral surfaces of the tubes; and that the tubes become bent. Consequently, it is a conventional practice to manually remove the concrete off the individual tubes and to manually straighten a bent tube, which is laborious and time-consuming.

German Patent Auslegeschrift DE-B-1 004 108 discloses an apparatus that can straighten a tubular circle. The article is straightened by passing it along a path through three straightening wheels.

German Patent DE-C-391 450 discloses an apparatus that can clean a tubular article. The article is passed along a path through three cleaning drums. Each drum is driven by a motor.

The present invention aims at the provision of an apparatus for automatically removing concrete off a tubular article and for automatically straightening a bent tubular article simultaneously with the removal of the concrete, which is labour-saving.

According to the present invention there is provided an apparatus for cleaning and straightening a tubular article, comprising:

- (a) a table over which a path taken by the article extends;
- (b) a straightening unit supported on the table and including a rotatable wheel driven by a motor and a guide pipe mounted on said wheel at an eccentric position relative thereto;
- (c) a plurality of feed-roller units supported on said table upstream and downstream of said straightening, each said feed-roller unit including a driven roller, and a follower roller normally urged toward said driven roller by a resilient means; and
- (d) a cleaning unit supported on said table downstream of said straightening unit, said cleaning unit including a plurality of drums, each rotatably mounted via shafts on a support frame, and each having teeth on its periphery and normally urged toward the axis of said cleaning by resilient means in which the plurality of drums are rotated by a motor.

The straightening unit includes a rotatable wheel, and a guide pipe supported on the wheel by

a bearing at an eccentric position. The feed-roller unit includes a rotatable driven roller, and a follower roller normally urged toward the driven roller resilient means such as a spring. The cleaning unit includes a plurality of drums each having teeth on its peripheral surface and normally urged toward a common central point by resilient means such as a spring.

With this arrangement, while the tubular article to be cleaned and straightened is passing through a feed roller unit, concrete on the tubular article is pressed and cracked between the driven roller and the follower roller. When the tubular article is inserted in the guide pipe of the straightening unit, the tubular article is eccentrically swayed to a predetermined extent in response to the rotation of the wheel, and the feed roller unit keeps reaction of the tubular article, thus restoring a bent tubular article into a straight form. When the tubular article reaches the centre of the cleaning unit, the teeth on the drums are forced against the peripheral surface of the tubular article to remove the concrete of the tubular article.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings in which:-

Figure 1 is a front elevational view of a cleaning and straightening apparatus embodying the present invention;

Figure 2 is a plan view of Figure 1;

Figure 3 is a side elevational view of Figure 1, showing parts of a feed-roller unit;

Figure 4 is an enlarged front view of parts of a straightening unit;

Figure 5 is a side elevational view of a wheel shown in Figure 4;

Figure 6 is a side elevational view of parts of a cleaning unit; and

Figure 7 is a front elevational view, partly in section, of Figure 6, showing drums of the cleaning unit.

As shown in Figures 1 and 2, a straightening unit 2 is supported centrally on a table 1, and first and second feed-roller units 3, 4 are supported on the table 1 upstream of the straightening unit 2, and third and fourth feed-rollers 5, 6 are supported on the table 1 downstream of the straightening unit 2. These units 2 to 6 are arranged on the table 1 in a straight line. Designated by A is the path of travel of a tubular article through the apparatus, which path A extends through the respective centres of the straightening unit 2 and feed-roller units 3, 4, 5, 6.

Between the third and fourth feed-roller units 5, 6, a cleaning unit 7 is disposed, the centre of which is aligned with the path A of the tubular article. the first, second, third and fourth feed-roller units 3, 4, 5, 6 are all identical in construction. Although the

number of the feed-roller units is not limited to four as in the illustrated example, it is preferable that a pair of feed-roller units is disposed one on each of the upstream and downstream sides of the straightening unit 2. Each of the feed-roller units 3, 4, 5, 6 serves to press and crack concrete attached to the outer peripheral surface of a tubular article, such as a single pipe, to move the tubular article along the path A and to support the tubular article.

The straightening unit 2 straightens a bent tubular article by eccentrically swaying the tubular article to a predetermined extent while the article is being supported by the second and third feed-roller units 4, 5. The cleaning unit 7 removes concrete attached to the other peripheral surface of the tubular article.

As shown in Figure 3, each of the feed-roller units 3, 4, 5, 6 includes a pair of support frames 8, 9, a driven roller 10 mounted on a shaft supported between the support frames 8, 9, a top plate 11 supported between the support frames 8, 9, a freely rotatable follower roller 13, and a pair of springs 12, mounted between the top plate 11 and the follower roller 13. The tubular article is moved along a straight line and sandwiched between the driven roller 10 and the follower roller 13, the latter being normally urged against the tubular article by the resilience of the springs 12.

A motor 14 for driving the feed-roller units and a plurality of sheaves or pulleys 16, 17, 18, 19, 20, 21 are also mounted on the table 1. An endless belt 22 is trained on a wheel 15 of the motor 14, the sheaves or pulleys 16, 17, 18, 19, 20, 21, and the driven rollers 10; and when the motor 14 is energised each driven roller 10 is rotated in the same direction.

The first feed-roller unit 3 has a guide 23 in which a tubular article to be cleaned and straightened is inserted in the direction of an arrow P, and the unit 3 also has a discharge tube 24 through which the tubular article is discharged. Each of the second and fourth feed-roller units 4, 6 has a discharge tube 24 via which the tubular article is discharged.

As a tubular article is inserted through one of the feed-rollers, the tubular article is supported horizontally, and any concrete on the tubular article is squeezed and cracked between the driven roller 10 and the follower roller 13.

The straightening unit 2 includes a pair of support frames 25, fixedly supported on the table 1 one on each of the upstream and downstream sides of the straightening unit 2, a connecting member 26' interconnecting the support frames 25, a bearing 26 is mounted in an opening in each respective support frame 25, a grooved wheel 28 rotatably supported in the bearings 26 via a pair of metal bushes 27, a bearing 29 mounted on the

wheel 28 at a position eccentric of the axis a of the wheel 28, and a guide pipe 30 mounted in the bearing 29. The guide pipe 30 rotates via the bearing 29 relative to the wheel 28.

The axis of the guide pipe 30 is eccentric with respect to the path A of the tubular article and thus, with respect to the axis a of the wheel 28. The guide pipe 30 has a trumpet-shaped or flared portion 31 so as to forcibly introduce the head of the bent tubular article.

The wheel 28 has in its outer peripheral surface one or more annular grooves 32 for receiving an endless belt 33 for driving the wheel 28. The endless belt 33 is trained on the wheel 28 and a pulley 35 mounted on the output shaft of the motor 34. Thus, the wheel 28 is rotated by the motor 34.

The tubular article having been inserted into the guide pipe 30 as supported by the second feed-roller unit 4 and/or the third feed-roller unit 5 is disposed in an eccentric position off the path A. In response to rotation of the wheel 28, the guide pipe 30 revolves around the axis a of the wheel 28 along an eccentric orbital path to sway the tubular article eccentrically around the axis a.

The distance X between the axis a of the wheel 28 and the axis $\bar{a}$ of the guide pipe 30 is set within the limit of the resiliency of the tubular article, such as a pipe. Therefore, if a tubular article is straight with no bend, the tubular article recovers its original straight form by its own restoration when it is discharged out of the straightening unit 2 after it is swayed eccentrically. To the contrary, if a tubular article has a bent portion, a restoring force more than the limit of resiliency acts on the bent portion so as to deform the tubular article into a straight form by plastic deformation while the tubular article is swayed eccentrically.

The cleaning unit 7 includes three support frames 36, 37, 38, mounted on the table 1, a pair of bearings 39, 40 mounted respectively on the support frames 36, 38, three drums 42, 43, 44 rotatably mounted between the support frames 36, 37 and between the support frames 37, 38 via respective arms 47, 48, 49, respective shafts 41 and respective bearings 45, and three springs 50, 51, 52 normally urging the respective drums 42, 43, 44 toward the axis of the cleaning unit 7.

When the tubular article having passed through the straightening unit 2 is inserted between the drums 42, 43, 44 along the path A, the cracked (as pressed by the feed-roller units 3, 4, in the previous step) concrete left on the peripheral surface of the tubular article is further broken into smaller pieces and is removed by teeth 46 as the drums 42, 43, 44 are rotated by a motor 54. At that time the fourth feed-roller unit 6 holds the forward end of the tubular shaft-like article and presses against the same to break up the cracked concrete com-

pletely.

The thus cleaned and straightened tubular article may be removed from the fourth feed-roller unit 6, or may be further transferred to an assembly line, such as a length-sorting line or storage line, by an additional feed-roller unit 53 disposed downstream of the table 1. The driven roller of the feed-roller unit 53 is operatively connected to the roller 10 of the fourth feed-roller unit 6 via an endless belt 55.

According to the apparatus thus constructed, concrete attached to a tubular article can be removed by the feed-roller units and the cleaning unit, and if bent the article can be straightened. Further, it is possible to perform both cleaning and straightening simultaneously and automatically, which is labour-saving and high in rate of production.

Claims

1. An apparatus for cleaning and straightening a tubular article, comprising:
 - (a) a table (1) over which a path (A) taken by the article extends;
 - (b) a straightening unit (2) supported on the table (1) and including a rotatable wheel (28) driven by a motor (34) and a guide pipe (30) mounted on said wheel (28) at an eccentric position relative thereto;
 - (c) a plurality of feed-roller units (3, 4, 5, 6) supported on said table (1) upstream and downstream of said straightening unit (2), each said feed-roller unit (3, 4, 5, 6) including a driven roller (10), and a follower roller (13) normally urged toward said driven roller (10) by a resilient means (12); and
 - (d) a cleaning unit (7) supported on said table (1) downstream of said straightening unit (2), said cleaning unit (7) including a plurality of drums (42, 43, 44), each rotatably mounted via shafts (41) on a support frame (36, 37, 38), and each having teeth (46) on its periphery and normally urged toward the axis of said cleaning unit (7) by resilient means (50, 51, 52), in which the plurality of drums are rotated by a motor (54).
2. An apparatus as claimed in claim 1, in which the distance (X) between the axis a of said wheel (28) and the axis of said guide pipe (30) is set within the limit of the resiliency of the tubular article.
3. An apparatus as claimed in claim 1 or claim 2 in which said guide pipe (30) has at its upstream end a trumpet-shaped portion (31).

Revendications

1. Dispositif pour le nettoyage et le redressement d'un article tubulaire, comprenant :
 - (a) une table (1) par laquelle passe un trajet (A) suivi par l'article;
 - (b) une unité de redressement (2) supportée sur la table (1) et comprenant une roue rotative (28) entraînée par un moteur (34) et un tuyau de guidage (30) monté sur ladite roue (28) à une position excentrique relativement à cette dernière;
 - (c) une pluralité d'unités de rouleaux d'amenée (3, 4, 5, 6) supportées sur ladite table (1) en amont et en aval de ladite unité de redressement (2), chacune desdites unités de rouleaux d'amenée (3, 4, 5, 6) comprenant un rouleau entraîné (10), et un rouleau subordonné (13) normalement sollicité vers ledit rouleau entraîné (10) par un moyen élastique (12); et
 - (d) une unité de nettoyage (7) supportée sur ladite table (1) en aval de ladite unité de redressement (2), ladite unité de nettoyage (7) comprenant une pluralité de tambours (42, 43, 44), chacun étant monté à rotation via des arbres (41) sur un châssis de support (36, 37, 38), et chacun comportant des dents (46) sur sa périphérie et étant normalement sollicité vers l'axe de ladite unité de nettoyage (7) par un moyen élastique (50, 51, 52), dans laquelle la pluralité des tambours est tournée par un moteur (54).
2. Dispositif selon la revendication 1, dans lequel la distance (X) entre l'axe a de ladite roue (28) et l'axe dudit tuyau de guidage (30) est fixée dans la limite de l'élasticité de l'article tubulaire.
3. Dispositif selon la revendication 1 ou 2, dans lequel ledit tuyau de guidage (30) comporte à son extrémité en amont une portion en forme de trompette (31).

Patentansprüche

1. Vorrichtung zum Reinigen und Ausrichten eines rohrförmigen Gegenstandes mit:
 - (a) einem Tisch (1), über den sich eine von dem Gegenstand genommene Bahn (A) erstreckt;
 - (b) einer Ausrichteinheit (2), die auf dem Tisch (1) gestützt ist und ein drehbares Rad (28) aufweist, das von einem Motor (34) angetrieben ist, und ein auf dem Rad (28) an einer dazu exzentrischen Position befestigtes Führungsrohr (30) aufweist;

- (c) einer Vielzahl von Zuführrolleneinheiten (3,4,5,6), die aufstromig und abstromig von der Ausrichteinheit (2) auf dem Tisch (1) gehalten sind und jeweils eine angetriebene Rolle (10) und eine Folgerolle (13) aufweisen, die normalerweise gegen die angetriebene Rolle (10) durch ein federnd elastisches Mittel (12) angetrieben wird; und 5
- (d) einer Reinigungseinheit (7), die abstromig von der Ausrichteinheit (2) auf dem Tisch (1) gehalten ist und eine Vielzahl von Trommeln (42,43,44) aufweist, deren jede über Wellen (41) auf einem Halterahmen (36,37,38) drehbar befestigt ist und auf ihrem Umfang Zähne (46) hat und normalerweise gegen die Achse der Reinigungseinheit (7) durch federnd elastische Mittel (50, 51,52) angetrieben wird, wobei die Mehrzahl der Trommeln durch einen Motor (54) gedreht wird. 10 15 20
2. Vorrichtung nach Anspruch 1, wobei der Abstand (X) zwischen der Achse a des Rades (28) und der Achse des Führungsrohres (30) innerhalb der Grenze der federnden Elastizität des rohrförmigen Gegenstandes eingestellt wird. 25
3. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei das Führungsrohr (30) an seinem aufstromigen Ende ein schalltrichterförmiges Teil (31) aufweist. 30

35

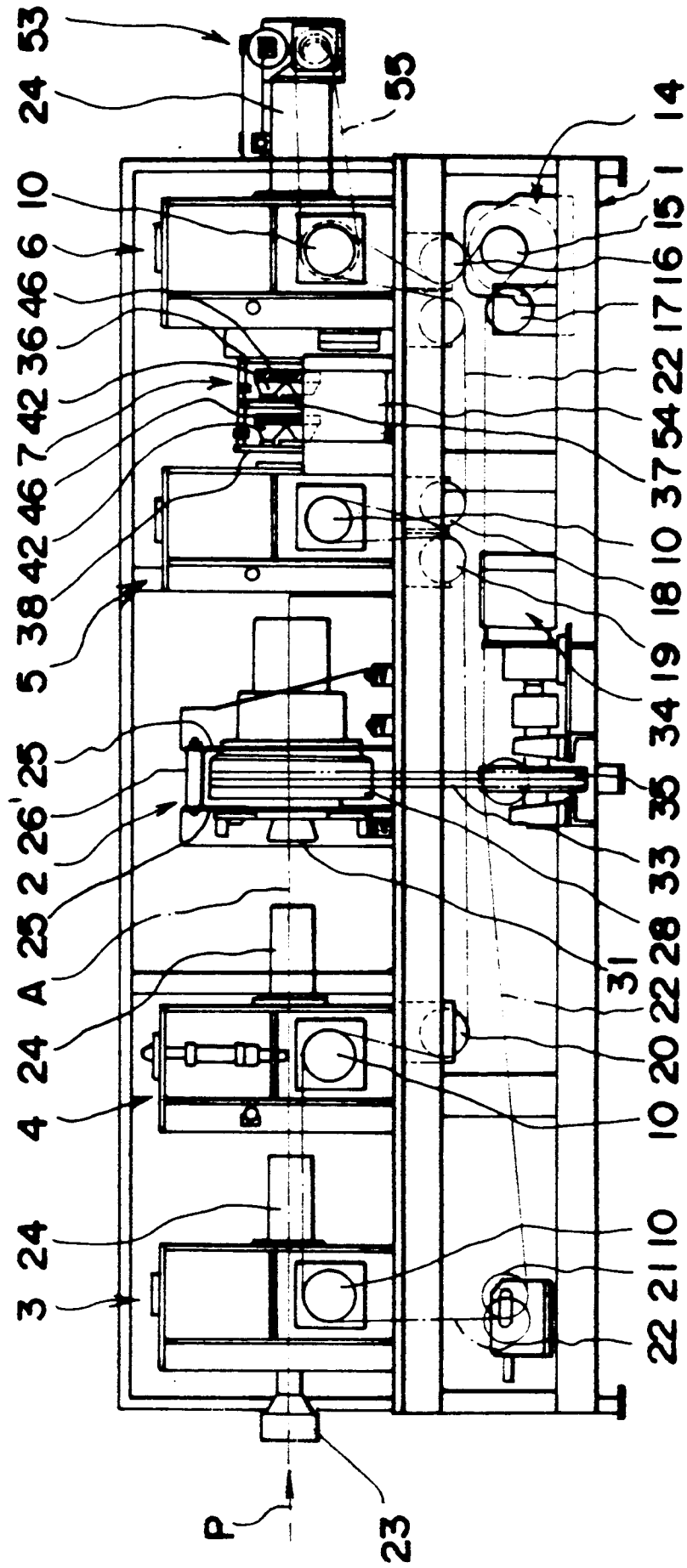
40

45

50

55

FIG. 1



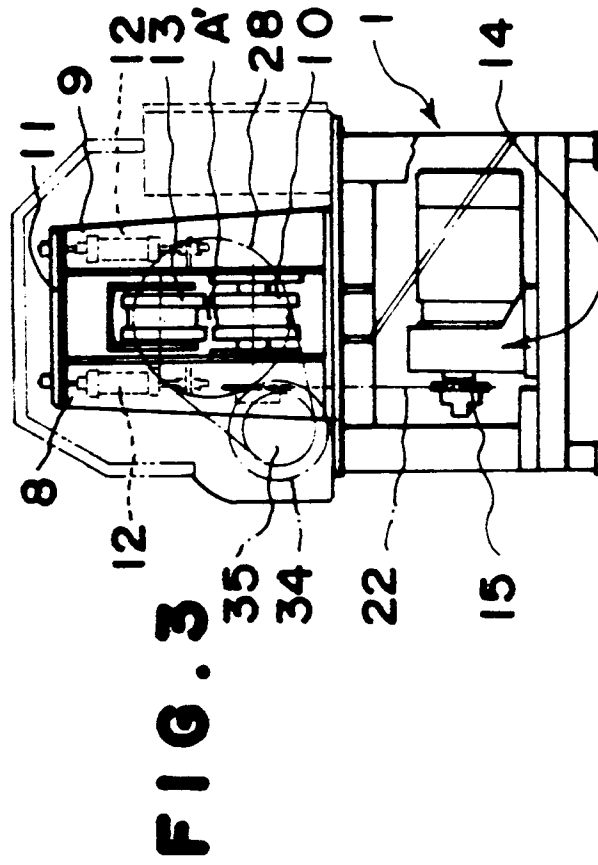
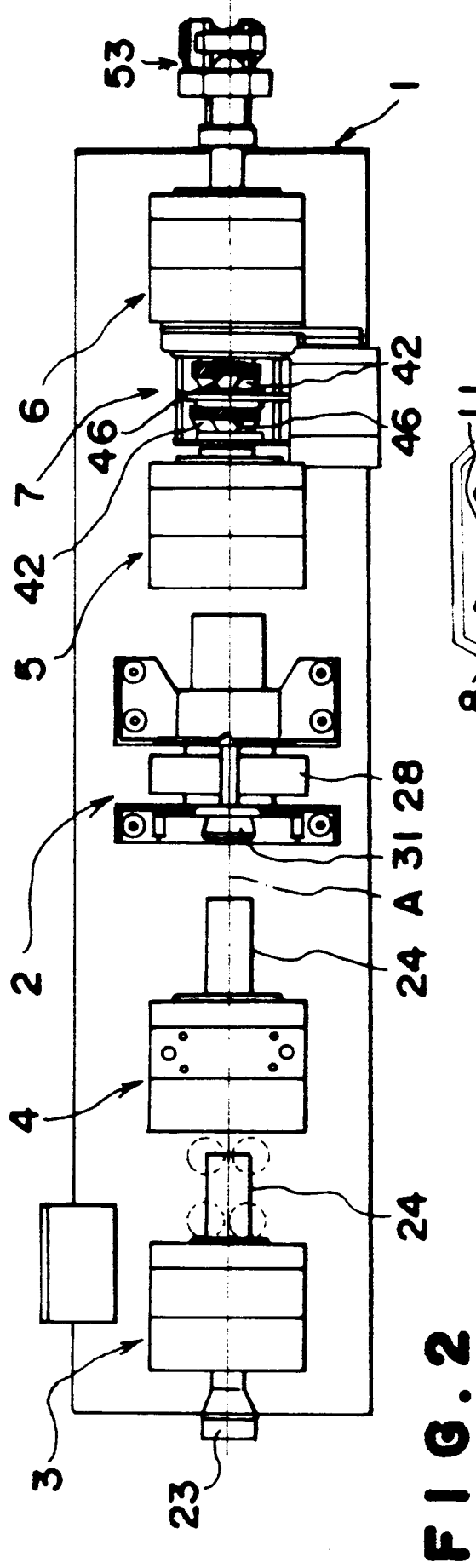


FIG. 4

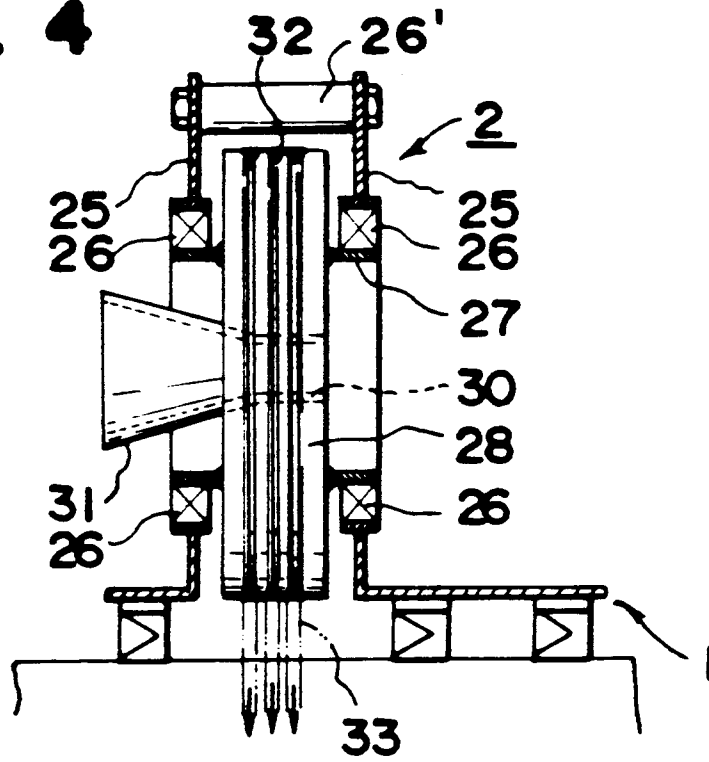


FIG. 5

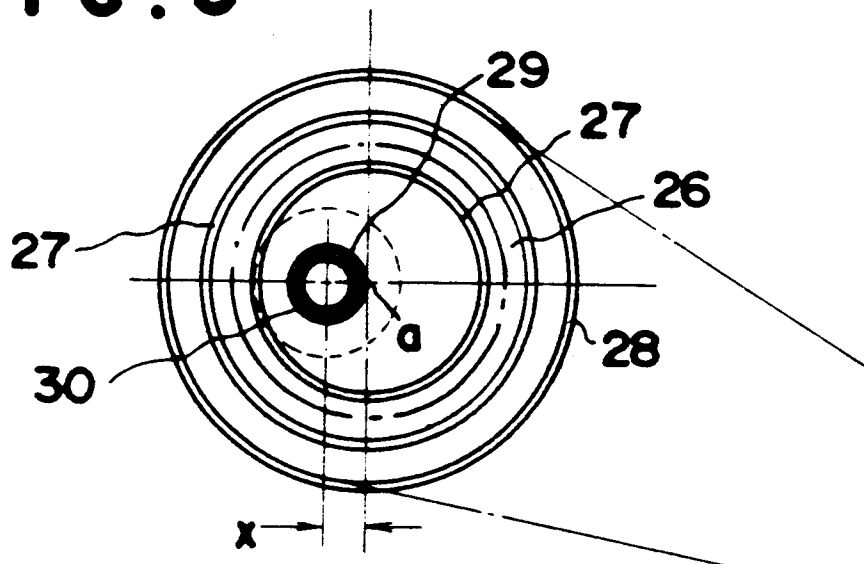


FIG. 6

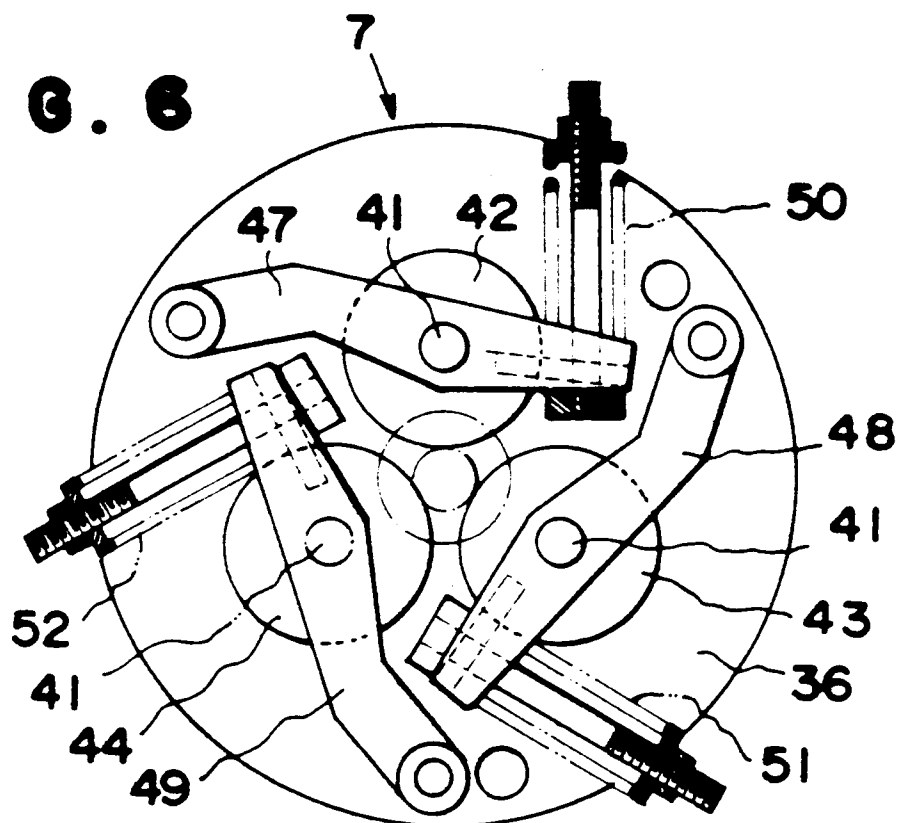


FIG. 7

