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(71) Applicant: **Olimpia 80 SRL**
27026 Garlasco (PV) (IT)

(72) Inventor: **Travini, Vittorio**
27020 Borgo S. Siro (PV) (IT)

(74) Representative: **Petruzziello, Aldo**
Racheli & C. S p A
Viale San Michele del Carso, 4
20144 Milano (IT)

(54) Apparatus and procedure for surface finishing of pipes by means of lamellar wheels

(57) For satin finishing or polishing of its outer surface, a pipe (T1, T2) is fed in a direction defined by its axis and turns around its own axis as it advances. The finishing is performed by means of a pack of lamellar wheels (S) which rotates around an axis (a30) parallel to the axis of the pipe and is carried by a sleeve supported on a rocker arm, so that it is possible to adjust the position thereof with respect to the pipe.

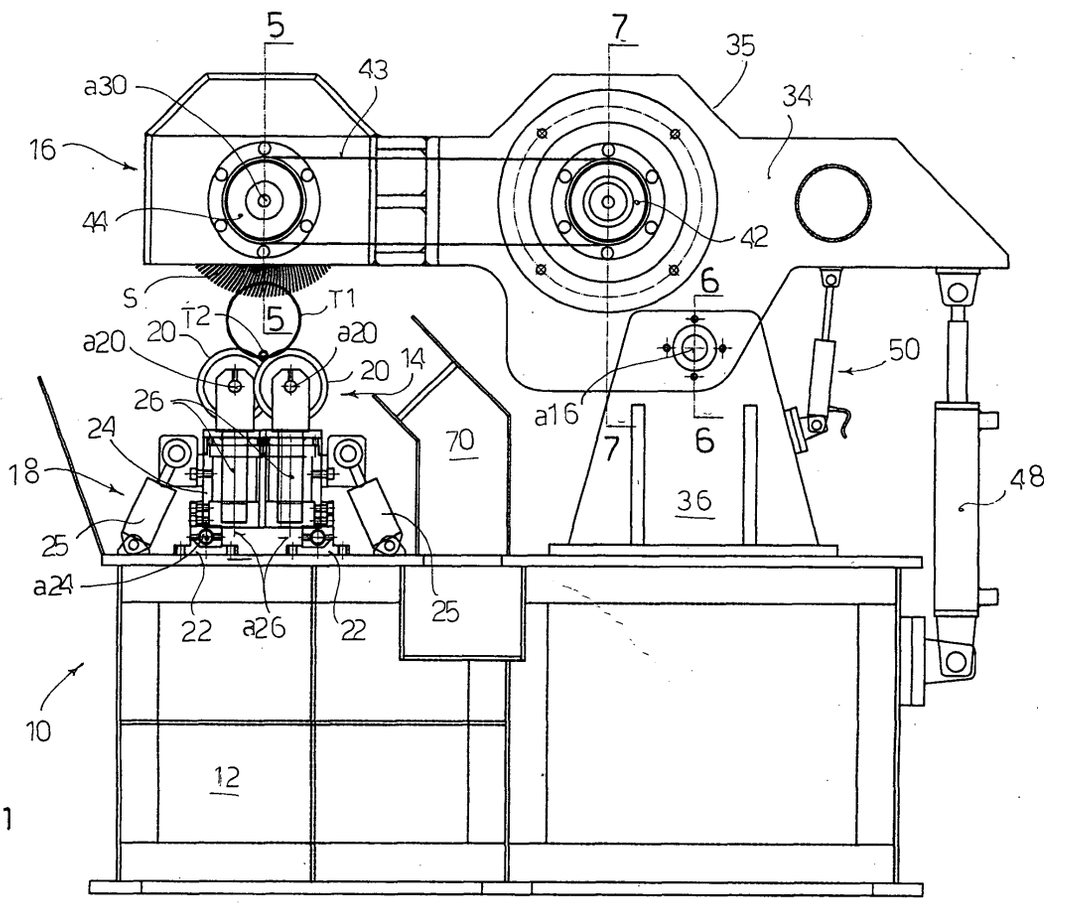

FIG.1

EP 1 350 600 A1

Description

[0001] The present invention refers to the field of surface finishing of pipes.

[0002] A brushing treatment on the outside surface of pipes by means of rotating brushes is known, in lines for the production of pipes starting from sheet metal, using a brush-holding head that turns around the pipe. In these systems the pipe advances without rotating. The finishing obtained is not precise and therefore the procedure cannot be used when a precision finishing is required.

[0003] It is also known to carry out more precise surface finishing on pipes, generally satin finishing, by means of abrasive belts. The pipe is supported on a bed of idle rollers and it is made to advance and to turn round its own axis by means of a motorised pinch roll. Each abrasive belt is endless and is wound on wheels, one of which is a rubber-coated drive wheel that presses the abrasive belt against the pipe. The operation is generally carried out by working on the pipe with a succession of belts of different grain, that is, in practice, by passing the pipe along belts with different grains. A problem of this type of finishing is the great wear on the abrasive belts, which could involve that an ever different type of finishing is obtained on successive parts of the product. To overcome this drawback, the operator is obliged to change the belt often, using the worn belts in different positions until they are worn out, and this leads to a considerable waste of time.

[0004] A further drawback is the need to lubricate the pipe with plenty of water in the area of friction thereof with the belt, and the use of water or other liquid for lubrication and cooling leads to the production of sludge, which is difficult and laborious to dispose of. Furthermore, water is a cause of deterioration of the fixed or moving mechanical parts and the sludge produced must be manually removed from the line by the operators, with a resulting waste of time.

[0005] Lastly, in the area of friction between the belt and the pipe there is considerable development of heat, which can lead to a loss of straightness of said pipe.

[0006] To overcome the abovementioned drawbacks, the machine and the procedure disclosed in claims 1 and 7 have been devised.

[0007] In other words, the procedure comprises the stages of operating on a pipe advancing along its own axis and rotating with a plurality of lamellar wheels or brushes placed alongside the pipe and rotating around an axis which is generally parallel to the axis of the pipe.

[0008] The apparatus comprises a bed of idle rollers supporting the pipe, a brush-holding sleeve mounted on a support adjustable in position with respect to the pipe bed, means for causing the pipe to advance and to rotate and means to determine the position of the brush-holding sleeve.

[0009] The invention makes it possible to overcome the aforementioned drawbacks, in particular to obtain an excellent level of surface finishing of the pipe (from satin finishing to polishing), and to avoid overheating and the resulting deformations of the pipe, though without requiring the use of cooling liquids.

[0010] An embodiment of the invention will be described below purely by way of nonlimiting example and with reference to the appended figures, in which:

Figure 1 is a partially schematic front view of the apparatus, with the idle rollers of the pipe-supporting bed illustrated in a position with their axes parallel to the axis of the pipe; two possible configurations of the pipe under production are illustrated, one with the maximum diameter and one with the minimum diameter;

Figure 2 is a plan view of the apparatus of Figure 1; the lamellar wheels or brushes and the sleeve whereon they are mounted are drawn with a dashed line and the pipe under production has been omitted for the sake of clarity of the drawing; the pipe-supporting idle rollers are illustrated in an oblique arrangement with respect to the axis of the pipe, that is to the advance direction;

Figure 3 is a side view from the left with respect to Figure 1, with the idle rollers in the arrangement of Figure 2;

Figure 4 is a rear view of the apparatus, that is to say from the opposite side to that illustrated in Figure 1,

Figure 5 is a section along the vertical plane marked 5-5 in Figure 1;

Figure 6 is a section along the plane marked 6-6 in Figure 1 and illustrates one of the pivot supports of a rocker arm which carries the sleeve with the lamellar wheels;

Figure 7 is a section along the vertical plane marked 7-7 in Figure 1;

Figure 8 is a section along the vertical plane marked 8-8 of Figure 4, but illustrates only the pinch roll, in the arrangement thereof with the axis parallel to the axis of the pipe.

[0011] Referring first to Figure 1, an apparatus for surface finishing of pipes according to the present invention is generally designated 10 and comprises, on a bed 12, a pipe supporting and feeding bed, designated 14, and a finishing unit, hereunder also called a grinding unit, designated 16.

[0012] The pipe under production will hereunder be denoted generically by T; in Figure 1 a maximum diameter pipe T1 and a minimum diameter pipe T2, such as

can be finished with the apparatus of the invention, have been drawn.

[0013] The pipe supporting and feeding bed 14 comprises a plurality of roller assemblies 18, each comprising one or more rollers or wheels 20 idle around generally horizontal axes a20. The roller assemblies are generally disposed on two rows, offset or in a quincunx, that is to say one on one side and the next, shifted longitudinally by a distance, on the other side of a runway for the pipe, which they define.

[0014] Each roller assembly 18 comprises a fixed frame 20 fixed to the bed and a moveable frame 24 thereon, rocking around a horizontal axis a24 under the control of a cylinder-piston 25. The rocking controlled by the cylinder-piston assemblies 25 disposes the frames 24 in a more or less upwardly widened position and, consequently, sets the rollers in a position more or less close to each other to adapt them to pipes to be treated of different diameters. On each rocking frame 24 there is installed an adjustable frame 26 bearing the roller, which can be rotated, by not illustrated means, around the respective vertical axis a26 to dispose the respective roller at the desired angle with respect to the axis of the pipe.

[0015] Above the roller bed 14, according the invention, a brush-holding shaft or sleeve 30 of the grinding unit 16 (Figures 3, 5) is supported. The brush-holding sleeve has a horizontal axis a30 parallel to the axis aT of the pipe and is rotatably supported, through two end universal joints 33 and 33', on the side arms 34 and 34' of a rocking arm structure 35 of the unit 16.

[0016] The arms 34, 34' are each mounted on a support 36, respectively 36', fixed to the bed, by means of a pivot part 37 (Figure 6) which defines a horizontal rocking axis a16 for the unit 16.

[0017] The arm 34 of the structure carries a motor 40 for rotation of the brushes, visible in Figures 2 and 7. The motor 40 has a drive shaft 41 which bears a drive pulley 42. A belt 43 transmits the motion to a driven pulley 44 integral with the pivot of a universal joint 33, of the end universal joints of the brush-holding shaft.

[0018] The unit 16 rocks therefore around the axis a16 defined by the pivots 37. To define the position of the unit 16 around the axis a16, an element of a cylinder-piston assembly 48, the other element of which is connected to the bed 12, acts on the part of the structure 34 opposite the brush-holding shaft. A linear transducer 50 of the optical or incremental type, per se known, is also mounted between the bed and the same part of the brush-holding structure to allow adjustment of the position of the brushes with respect to the pipe in view of the diameter of the pipe and of the wear of the brushes. The brushes used are preferably lamellar rotating brushes ("wheels"), available on the market and denoted by S in the figures. Said lamellar wheels comprise a body, generally of plastic material, and radial foils extending from the body, generally consisting of cotton or polyester cloths, or of wheels of different materials that have abrasive incorporated, with or without abrasive powders applied. Lamellar wheels preferably from 10 to 500 mm in diameter and lengths from 100 to 1000 mm can be used. The wheels are locked in a pack on the sleeve, possibly with a longitudinal gap between wheels or groups of wheels.

[0019] Rotation of a pipe T under production (T_1, T_2) around its own axis is determined by means of one or more pinch rolls, per se known. The pinch roll assembly, which can be seen in Figures 3, 4 and 7 and is generally designated 60, comprises a pinch roll 61 coated with a layer of material suitable to create a drawing or gripping contact on the pipe, for example a rubber-type material that can grip the pipe and is integral with a shaft 62 taking its drive from the drive shaft of a motor 63. The assembly is supported by a rocker arm 66 mounted rocking on an upright 67 fixed to the bed. The position of the roller with respect to the pipe is determined by means of a cylinder-piston assembly 68, connected to the bed and to the arm 66.

[0020] Feeding of the pipe is determined by rotation thereof, due to the pinch roll, in contact with the rollers 20 disposed with their axes oblique with respect to the axis of the pipe.

[0021] Reference numeral 70 denotes a dust suction slit. An air-cooling tunnel (not illustrated) can be provided along the course of the pipe. It is not necessary to use cooling liquids.

[0022] Reference numeral 74 denotes a sensor to detect the presence of the pipe.

[0023] The surface finishing that is obtained is good and uniform over the whole pipe, since the brushes are brought nearer to the axis of the pipe as they wear and no overheating and consequent deformations occur.

Claims

1. Apparatus for surface finishing of a pipe, for example satin finishing or polishing, comprising means (14) to support the pipe rotatably around its own axis, means (60) to make the pipe rotate around its own axis, and means to feed the pipe in the direction defined by its own axis, **characterised in that** it further comprises brush-holding means for assembly of a plurality of lamellar finishing brushes or wheels (S) rotating around an axis (a30) substantially parallel to the axis of the pipe under production, means (48) for positioning said brush-holding means and means (42) for driving said brush-holding means in rotation.

2. Apparatus according to claim 1, **characterised in that** the brush-holding means comprise a sleeve (30) carried on a rocker arm support (35) mounted on supports (36) which define a rocking axis (a16) of the support parallel to the axis of the pipe.

3. Apparatus according to claim 1, **characterised in that** the means for supporting the pipe rotatably comprise an idle roller bed wherein the idle rollers are disposed according to a quincunx arrangement.

4. Apparatus according to claim 3, **characterised in that** each roller has its axis of rotation (a 20) adjustable around a vertical axis (a26).

5. Apparatus according to claim 4 wherein the rollers (20) are supported so as to be able to be moved away from or toward each other to adapt to pipes of different diameters.

6. Apparatus according to claim 1 **characterised in that** the brush-holding means comprise a brush-holding sleeve (30) mounted on universal end joints (33, 33') and with the axis (a30) substantially parallel to the axis of the pipe under production.

7. A finishing procedure on the outer surface of pipes, **characterised in that** rotating lamellar wheel brushes are used, the pipe is fed along a feeding axis coinciding with the longitudinal axis of the pipe and at the same time it is made to rotate around said axis.

8. A procedure according to claim 7, **characterised in that** the position of the axis of rotation of the brushes is adjusted with respect to the axis of the pipe.

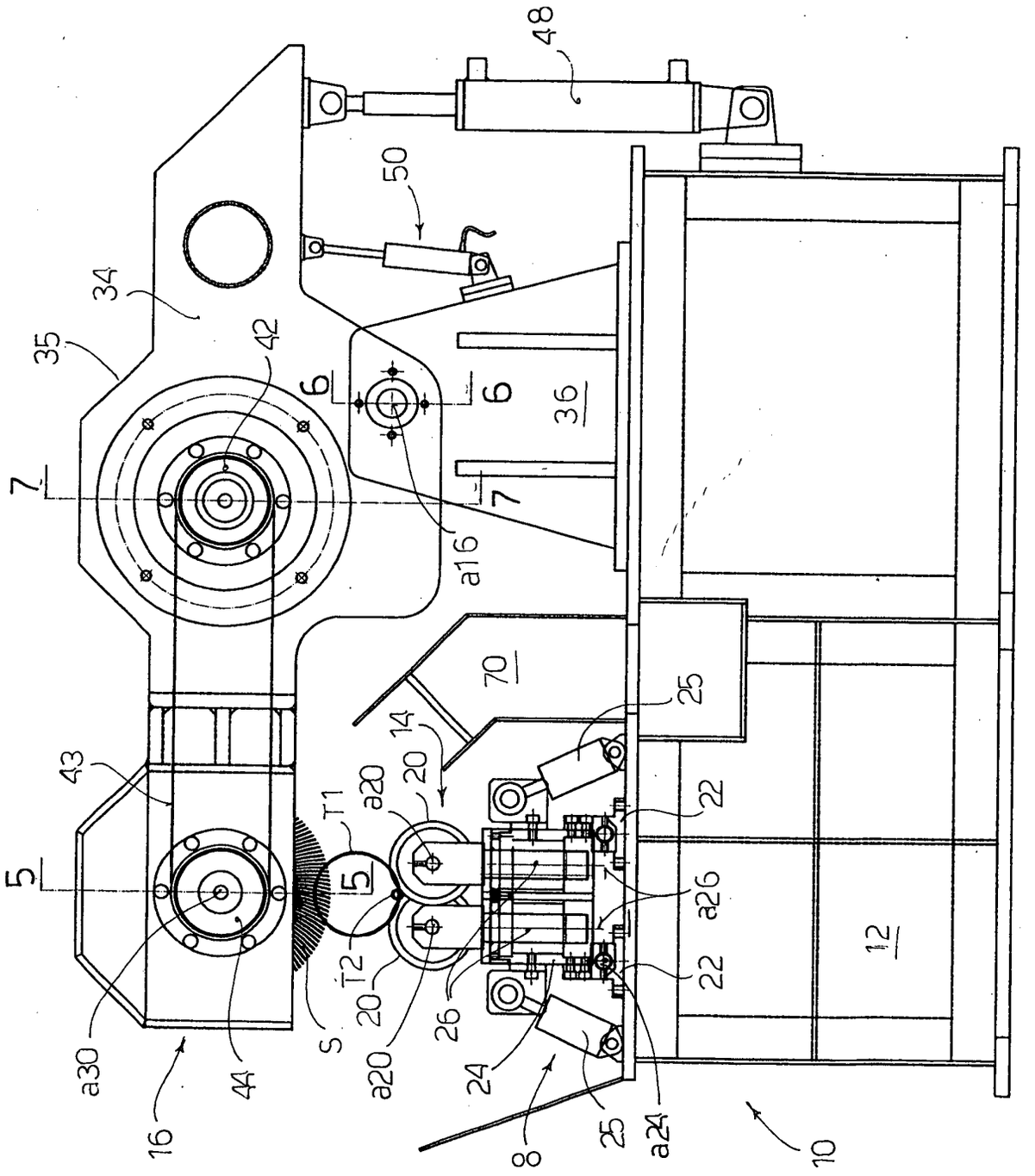
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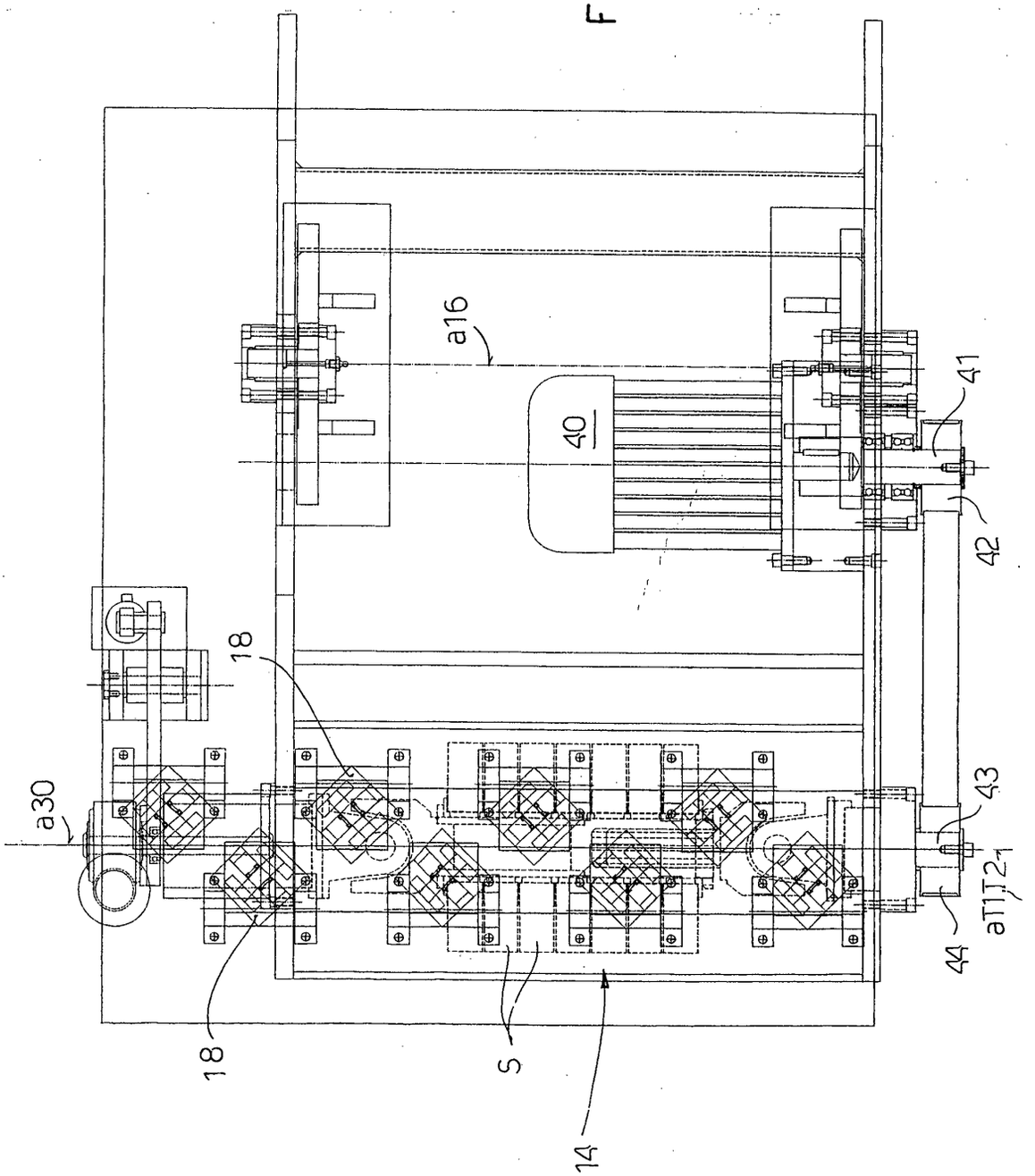
FIG.1

FIG. 2



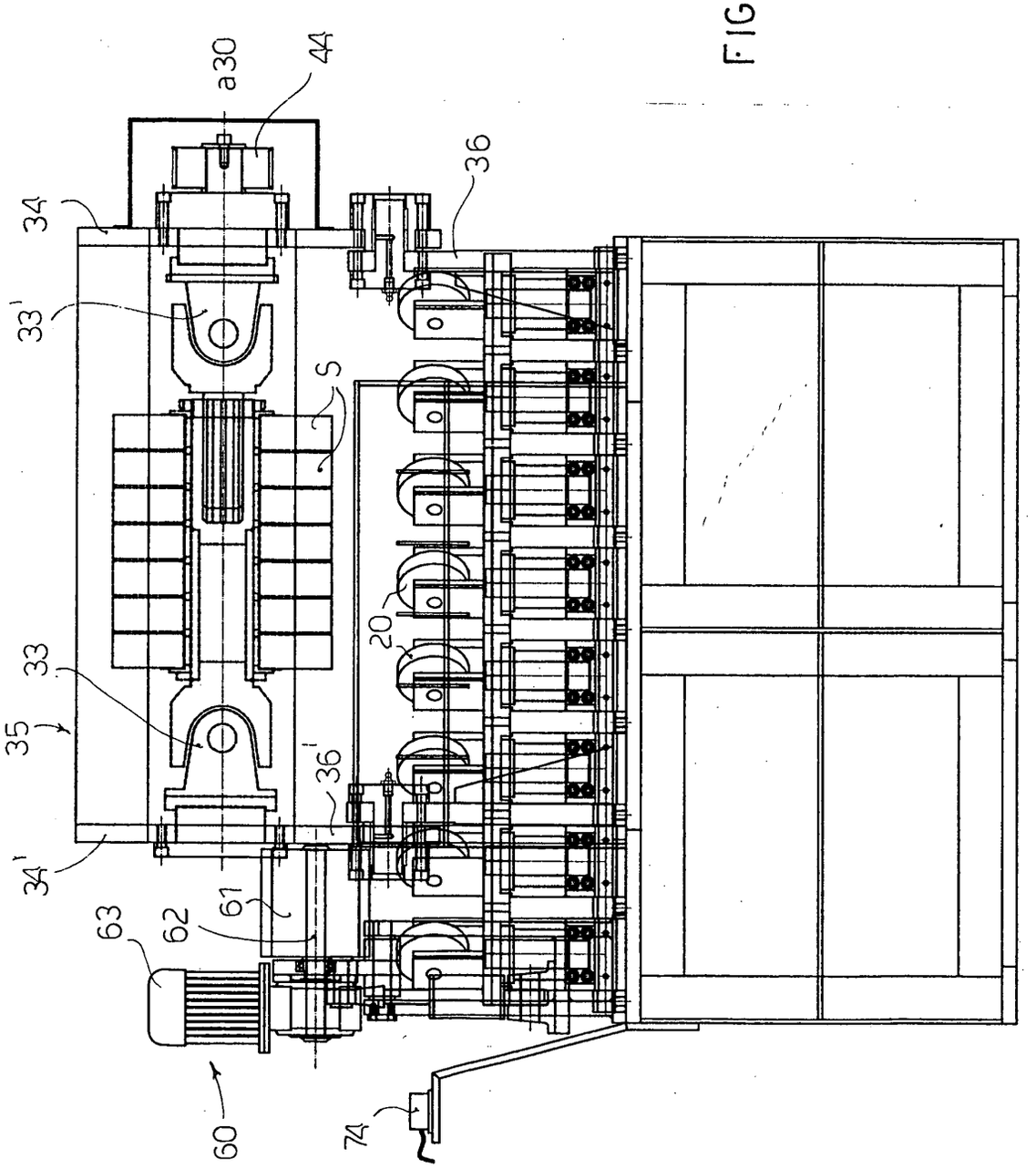


FIG.3

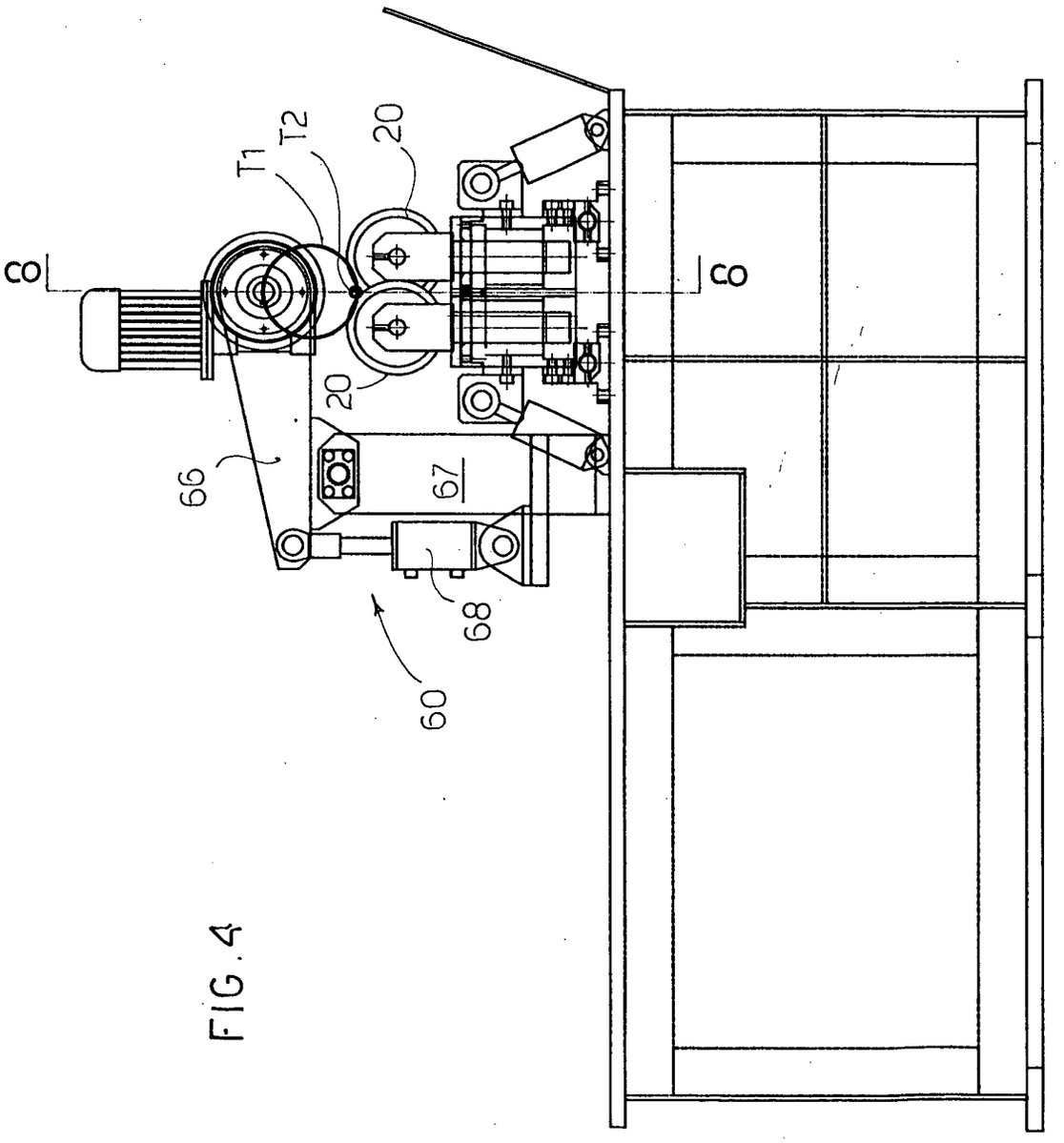


FIG. 4

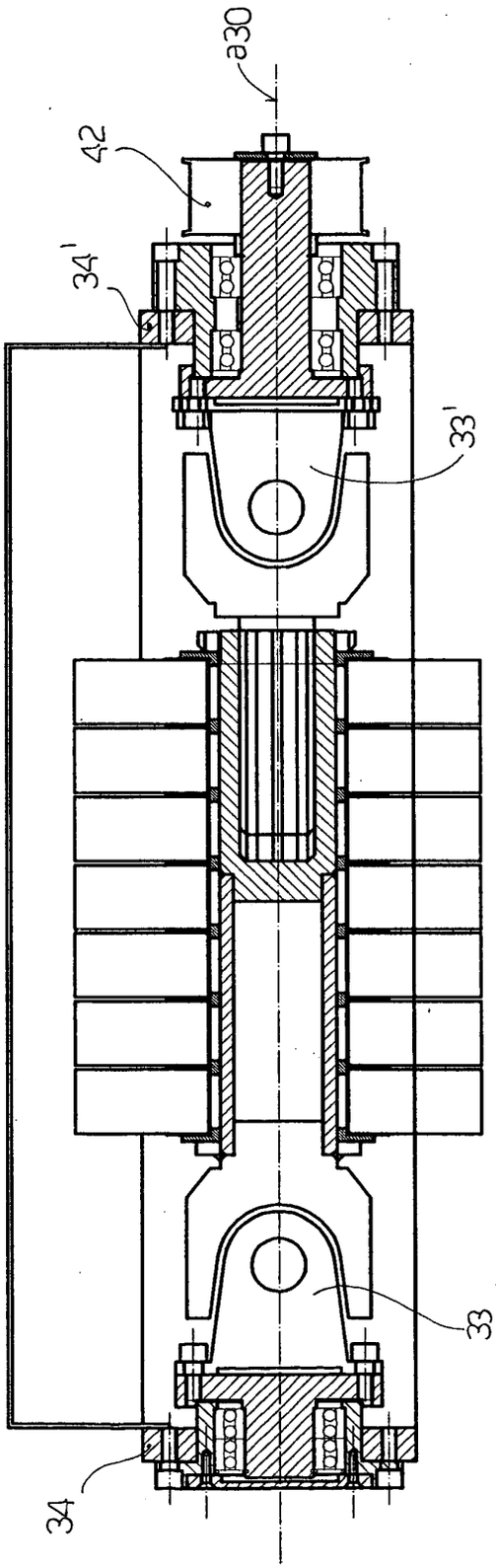


FIG.5

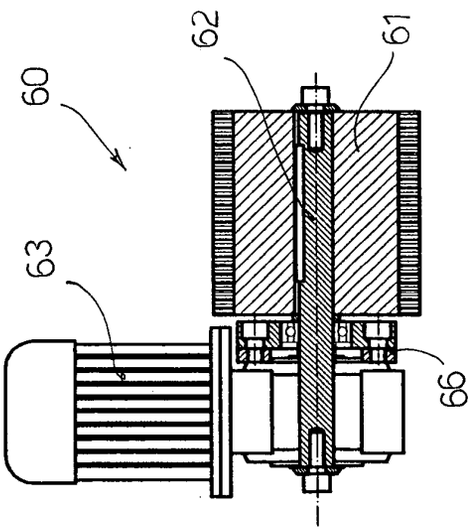


FIG.8

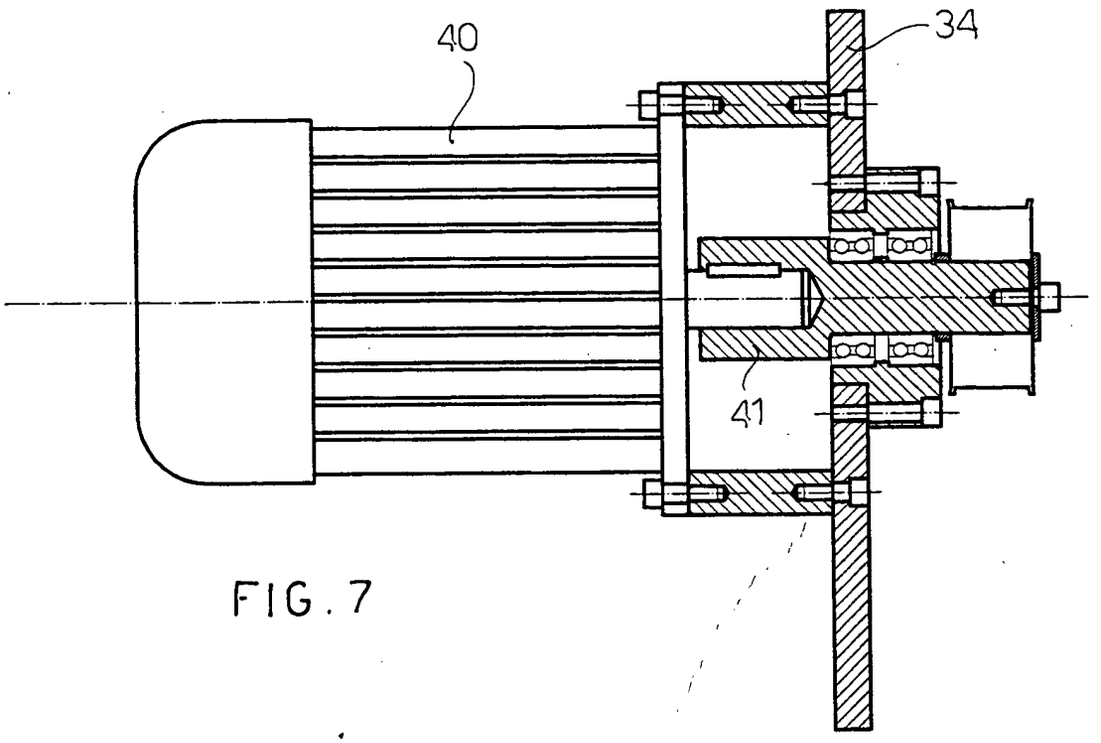


FIG. 7

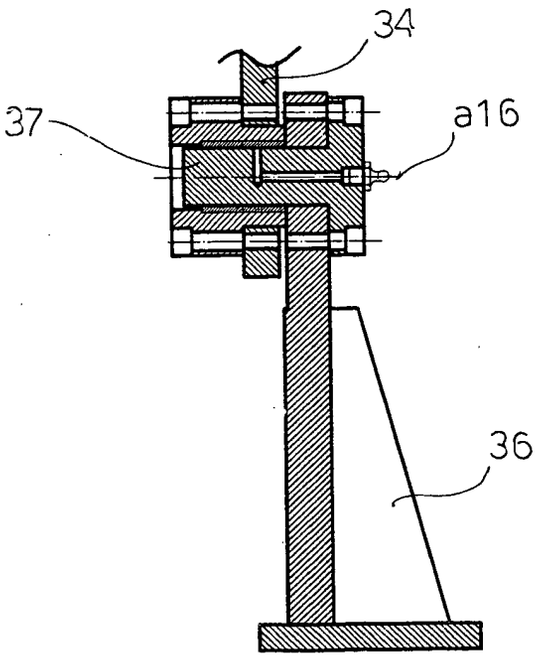


FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 4196

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B24B
B24D
B23Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	9 July 2003	Gelder, K

CATEGORY OF CITED DOCUMENTS

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