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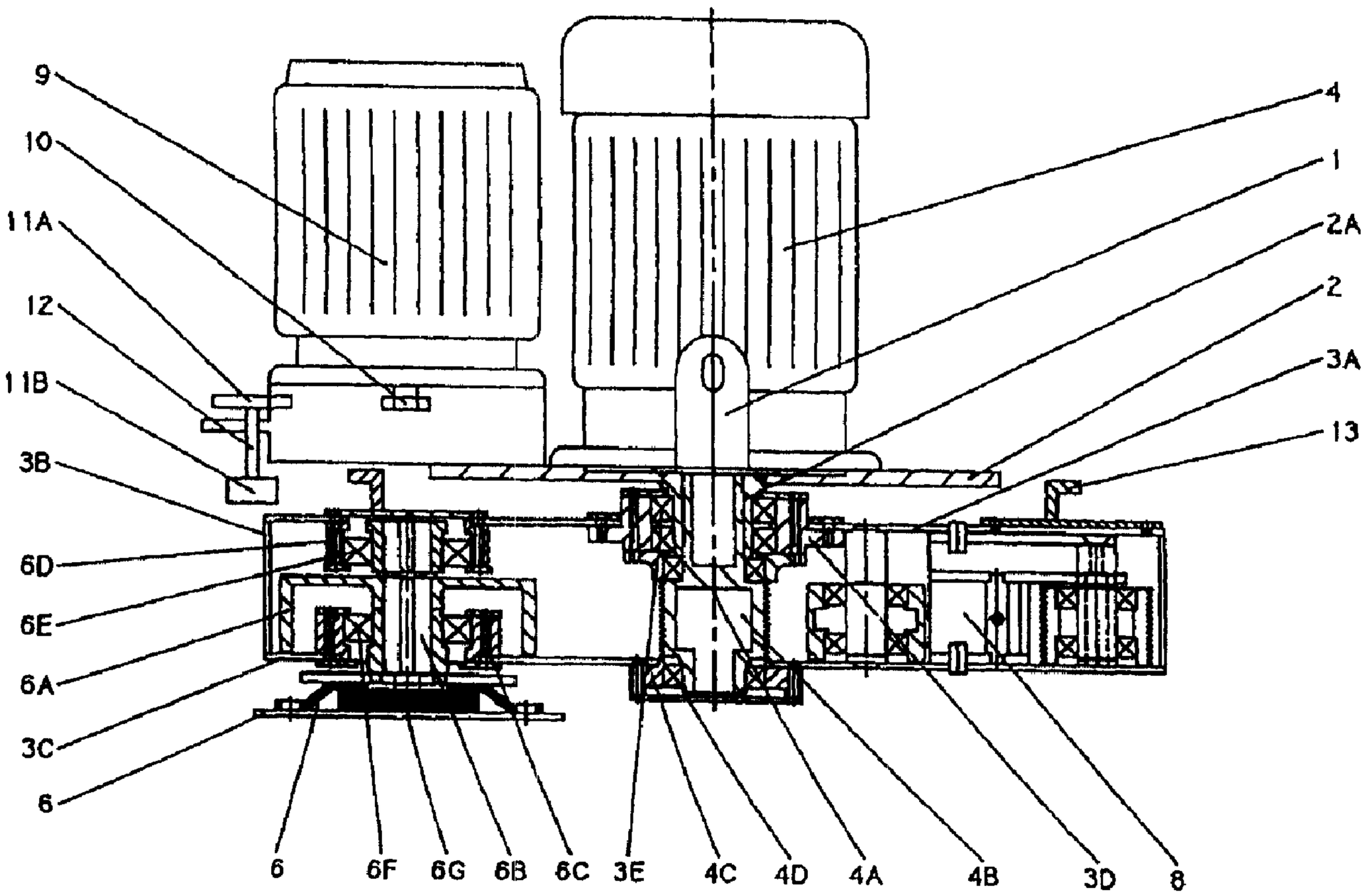
(54) Titre : MACHINE MOBILE DE PONCAGE DE SURFACES
(54) Title: A MOBILE SURFACING MACHINE




(57) Abrégé/Abstract:
The specification discloses a mobile surfacing machine having a planetary head (3) and several satellite heads (6). The satellite heads are adapted to grind a surface and the planetary head is adapted to move the surfacing machine around the surface in an elliptical path. The planetary head is driven by a motor (9) separate from that (4) used to drive the satellite heads.

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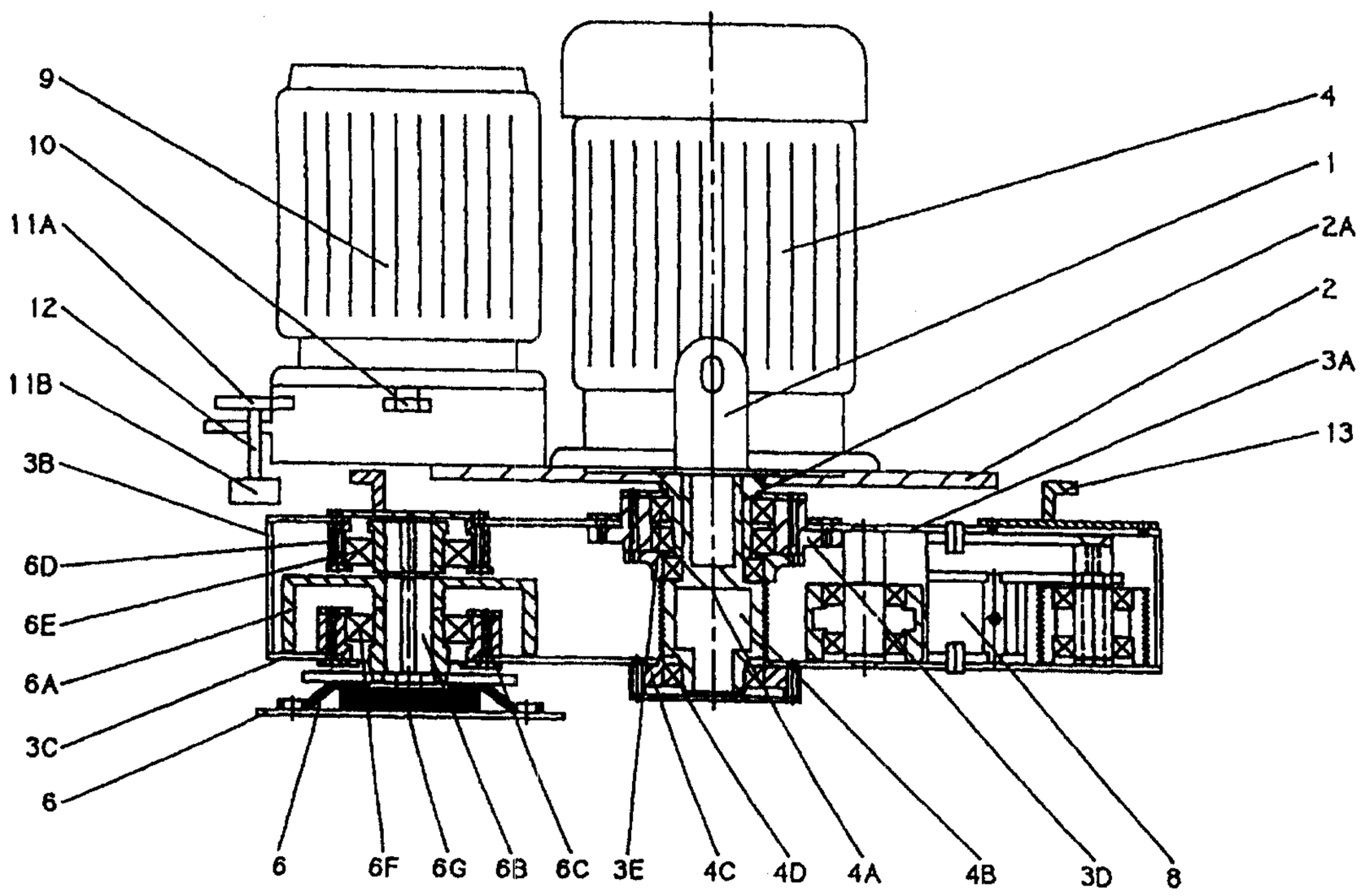
(54) Title: A MOBILE SURFACING MACHINE




(57) Abstract

The specification discloses a mobile surfacing machine having a planetary head (3) and several satellite heads (6). The satellite heads are adapted to grind a surface and the planetary head is adapted to move the surfacing machine around the surface in an elliptical path. The planetary head is driven by a motor (9) separate from that (4) used to drive the satellite heads.

# A MOBILE SURFACING MACHINE

The present invention relates generally to a mobile surfacing machine suitable for use in surfacing flooring. In particular the present invention relates to planetary surfacing machines suitable for use on concrete, stone and wooden floors.

The surfacing machine of the present invention may be used for various domestic, commercial and industrial applications where surfacing is required. The surfacing machine of the present invention is particularly well adapted for use in surfacing floors, particularly floors constructed of concrete, stone or wood. Even though the present invention is described with particular reference to surfacing floors, it is not limited to this use and can be used on a variety of surfaces, indoors and outdoors.

Surfacing machines are commonly used to strip or smooth flooring by grinding away any material adhered to the flooring and, if necessary, grinding away part of the flooring. They can provide a clean, smooth and essentially flat surface to which new coverings or coatings can be applied. Builders and renovators for examples often use surfacing machines to remove adhesive which has been used to adhere linoleum, tiles or other coverings to a floor and to remove coatings of varnish, paint or polymer (such as epoxy based coatings).

Surfacing machines are also commonly used to smooth a rough flooring surface or remove surface levelling compounds to create a floor which has a smooth, level surface. Certain surfaces, including some types of concrete, are also suitable for polishing using a surfacing machine.

One of the best known types of floor surfacing machine is the planetary-type machine. These machines generally comprise three satellite surfacing heads within a planetary head, with the planetary and satellite heads rotating in opposite directions. Typically the satellite

heads in these machines are driven and the planetary head rotates at a rate which is primarily governed by the amount of friction created between the satellite heads and floor being surfaced. Accordingly, if the satellite heads are driven at high speed in order to rapidly grind the surface the planetary head tends to rotate rapidly also, but this can cause the machine to bounce and become difficult to control when used on rough floors. However, if the satellite heads are slowed to improve the stability of the machine the production capacity and economy of the surfacing machine is reduced. Moreover, when the satellite heads are driven at high speed in order to improve the production capacity of the surfacing machine wear on the machine parts and surfacing heads is increased.

United States patent number 5,637,032 describes a floor surfacing machine generally of this type but further comprising a belt pulley attached to the frame of the surfacing machine, belt pulleys arranged on the shafts of the surfacing discs, and a belt running around these and the belt pulley attached to frame for the purpose of controlling the rotation of the planetary head. However the arrangement described therein is suitable only to limit the rate of rotation of the planetary head. This arrangement serves little purpose under operating conditions where there are substantial frictional forces between the satellite heads and the floor to be surfaced since the rate of rotation of the planetary head is already limited by these frictional forces. Under conditions where relatively low frictional forces exist between the satellite heads and the floor to be surfaced the belt may limit the rate of rotation of the planetary head, but when effective, the belt governing the motion of the planetary head does so in a relation that is in direct proportion to that of the satellite heads, and this allows for little flexibility in the modes of operation of the machine. The present invention provides a machine in which greater stability of operation can be achieved with dramatically

increased production capacity and flexibility of operation.

According to the present invention there is provided a mobile surfacing machine including a frame to which a planetary head is rotatably mounted, at least one satellite head rotatably mounted within the planetary head, the at least one satellite head being adapted for grinding a surface, first drive means for driving the planetary head and second drive means for driving the or each satellite head wherein the first and second drive means are independently operable.

Typically the mobile surfacing machine includes a plurality of satellite heads, preferably three heads, although machines with four satellite heads are also envisaged.

Typically each of the said satellite heads comprises a surfacing disc arranged on a corresponding shaft rotatably mounted within the planetary head. In this arrangement each of said shafts is driven by second drive means, which comprises a belt pulley mounted to each of said shafts and a drive belt run around each of the belt pulleys and driven by a motor mounted to the frame.

In a particularly preferred embodiment of the invention, the second drive means includes a belt tensioning device. Typically the belt tensioning device comprises a belt tensioning pulley and is used to tension the drive belt passing around the belt pulleys mounted to the satellite shafts. The tensioning device simplifies assembly and servicing of the surfacing machine because the belt can be tensioned after a disassembled machine is reassembled.

Preferably, said first drive means comprises a motor which drives the planetary head via a series of geared pulleys and belts.

It will be appreciated that the first drive means and second drive means are independent systems driven by separate motors and operate entirely independently. As a result the satellite heads and planetary head are driven

independently, and can be driven in a mutually opposing direction of rotation or in the same direction of rotation, and can be driven at different speeds independently of one another. This allows the operator to, for example, drive the planetary head at a relatively low rate over a rough floor so that the mobile surfacing machine does not bounce when it strikes rough patches but still drive the satellite heads at relatively high speed so as to maintain production capacity of the machine. If the surface is to be only lightly finished the planetary head may be driven quickly so that the surfacing machines covers the floor surface at a rapid rate and the satellite heads remain in contact with any given portion of the floor for only a relatively short time. On the other hand, if one wishes to remove a relatively large proportion of the surface the planetary head may be slowed down so that the satellite heads remain in contact with any given portion of the floor for a comparatively longer period of time. This provides the surfacing machine of the present invention with considerable flexibility in its applications.

Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a cross sectional view of one embodiment of the machine in accordance with the present invention;

Figure 2 is a plan view of the second drive means showing the operative connection that drives the satellite heads and their accompanying shafts; and

Figure 3 is a plan view of one alternative arrangement for the first drive means.

The surfacing machine illustrated in the Figures has a frame comprising motor mounting plate 2 and a control chassis (not shown) which is attached to the nib 1 and comprises means by which the operator can move the machine over the floor to be surfaced. Typically this is a handle arrangement with appropriate provision made for the

necessary connections to be made to allow a control panel, for control of the operation of the machine, to be provided on the handle arrangement.

The apparatus further comprises a planetary head 3 consisting of a cylindrical wall 3b closed at both ends by a top plate 3a and bottom plate 3c. The motor mounting plate 2 is mounted upon the planetary head 3 by means of the main bearing assembly comprising the main bearing mount 2a which is a fixed extension of the motor mounting plate, the main bearing housing 3d which is fixed to the planetary head 3 and the main bearing 3e. It has a pulley 13 secured to top plate 3a, and can be driven to rotate in either direction by belt 13a which is wrapped around pulley 13 and driven by the first drive means.

The first drive means comprises a motor 9 fixed to the motor mounting plate 2. Fixed upon the shaft of the smaller motor 9, is a pulley 10. This pulley interacts via a belt 10a, with a second pulley 11a, to drive a shaft 12. Mounted at the lower end of this shaft is a third pulley 11b. This pulley (11b) then interacts with the pulley 13 via a belt 13a, as last seen in Figs 1 and 3. The interaction between the top drive motor 9 and the top drive pulley via the series of belts and pulleys is termed the "top drive system".

The second drive means comprises a motor 4 which is mounted to motor mounting plate 2, and has a shaft 4a on which the drive pulley 4b is attached. The drive pulley is stabilised by the drive shaft bearing assembly 4c and accompanying bearing 4d.

The drive pulley 4b is operatively connected to the satellite heads 6 by the primary drive belt 7 running around the belt pulleys 6a, which are in turn mounted on the satellite head shafts 6b. This arrangement can best be appreciated in Figure 2. To ensure optimum belt tension during operation, an adjustable belt-tensioning device 8 is provided. This tensioning device also facilitates servicing of the machine as belt tension can be applied

following assembly of parts, unlike in previously disclosed machines, where the drive belt has to be stretched over the belt pulleys. It will be appreciated that the arrangement in the previously disclosed machines provides great difficulty assembling the machine from that point on. The interaction of drive pulley 4b, primary drive belt 7, belt pulleys 6a and belt tensioner 8 form the mechanism for the "bottom drive system".

Rotatably mounted in the planetary head 3 are three satellite head shafts 6b that exit through both the top 3a and bottom 3c plates of the planetary head. A top bearing assembly comprising a top bearing housing 6d and top bearing 6e and a bottom bearing assembly comprising of a bottom bearing housing 6c and bottom bearing 6f achieves their rotatory status. Mounted to the bottom end of the satellite shafts 6b are the surfacing discs 6g, which are actively involved in surfacing the floor.

In operation, the apparatus, including the control chassis (not shown), is moved by the operator over the floor to be surfaced. By selecting the amount of drive to be provided to the planetary head by the motor 4 the operator can control the speed of rotation of the planetary head. The direction of rotation of the planetary head can be controlled by driving in either a forward or reverse direction. Likewise, by controlling the amount of drive provided by the motor 9, the operator can control the speed and direction of rotation of the satellite heads 6, and motors 4 and 9 are controlled independently. Accordingly, the direction and rate of rotation of the planetary head 3 and the secondary heads 6 can be controlled separately by the operator.

It will be appreciated that the rate of rotation of the planetary head 3 essentially controls the amount of time that the satellite heads 6 spend in contact with a given portion of the floor, and the rate of rotation of the satellite heads 6 is determinative of the amount of grinding applied to the floor. Hence, if the rate of

rotation of the planetary head 3 is slowed down because a floor is rough the rate of rotation of the secondary head 6 can be maintained, so the rate of production is maintained but without the risk that the planetary head will bounce on the rough surface and cause damage to the floor being surfaced. Similarly, if only a small amount of material is to be removed the planetary head 3 can be driven at a high rate to reduce the contact time of the satellite heads 6 with any given portion of the floor and/or the rate of rotation of the satellite heads 6 can be reduced. Control of the planetary head speed independently from the satellite heads is not possible in the prior art arrangements where the direction and speed of rotation of the planetary head is determined by the amount of drive provided to the satellite heads.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. It is to be understood that the invention includes all such variations and modifications which fall within the spirit and scope of the invention.

CLAIMS:

1. A mobile surfacing machine including a frame to which a planetary head is rotatably mounted, at least one satellite head rotatably mounted within the planetary head, the at least one satellite head being adapted for grinding a surface, first drive means for driving the planetary head and second drive means for driving the or each satellite head wherein the first and second drive means are independently operable.

2. A mobile surfacing machine according to claim 1, wherein the machine has three or four satellite heads.

3. A mobile surfacing machine according to claim 1 or claim 2, wherein the or each satellite head includes a surfacing disc arranged on a corresponding shaft rotatably mounted within the planetary head.

4. A mobile surfacing machine according to claim 3, wherein the second drive means includes a belt pulley mounted to each shaft and a drive belt for connecting the drive pulley(s) to a first motor mounted on the frame.

5. A mobile surfacing machine according to claim 4, wherein the second drive means further includes a drive belt tensioning device.

6. A mobile surfacing machine according to claim 5, wherein the drive belt tensioning device includes a tensioning pulley around which the drive belt also passes.

7. A mobile surfacing machine according to any one of claims 1 to 6, wherein the first drive means includes a second motor which drives the planetary head via a series of geared pullies and shafts.

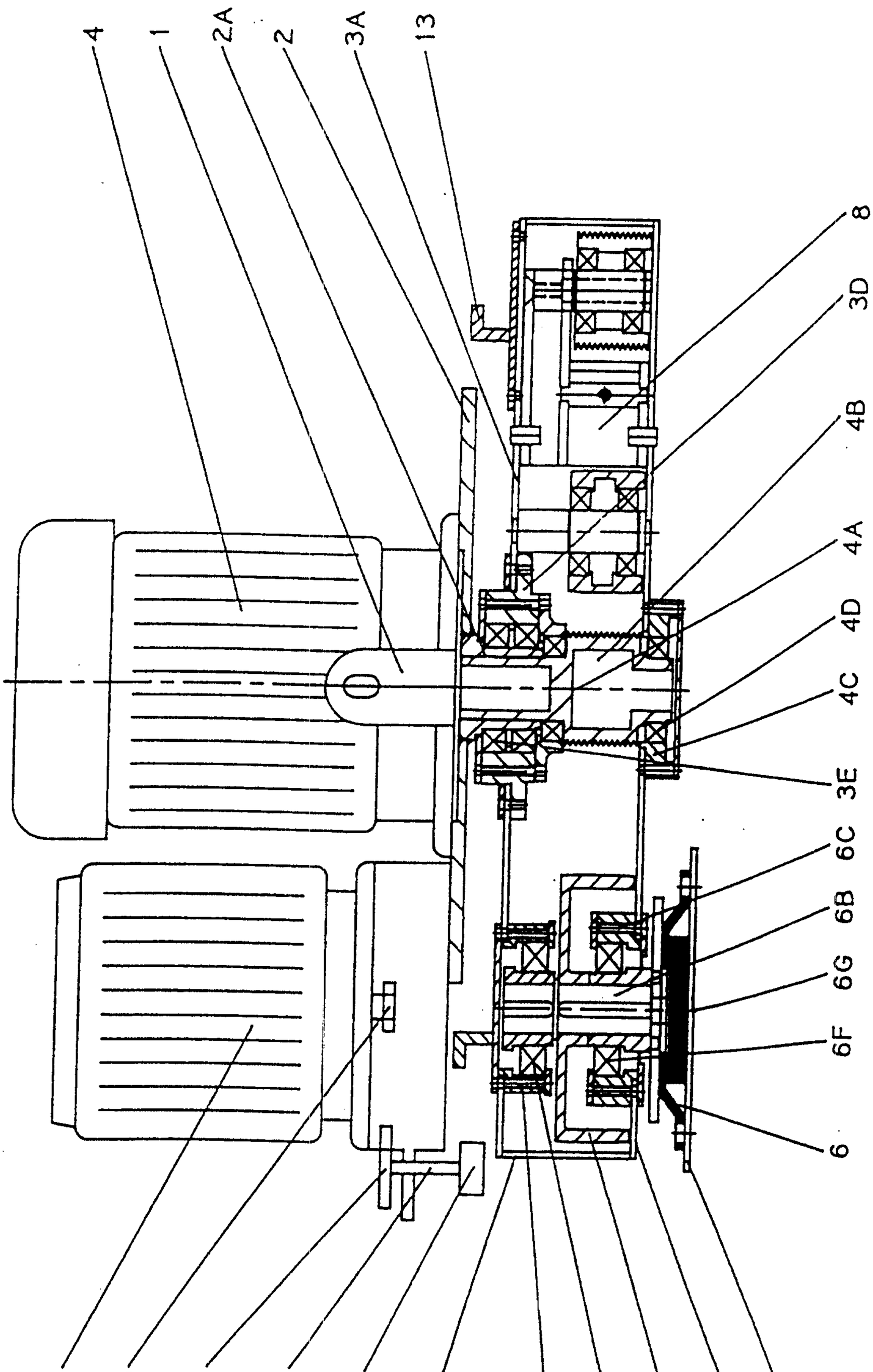

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FIGURE 1

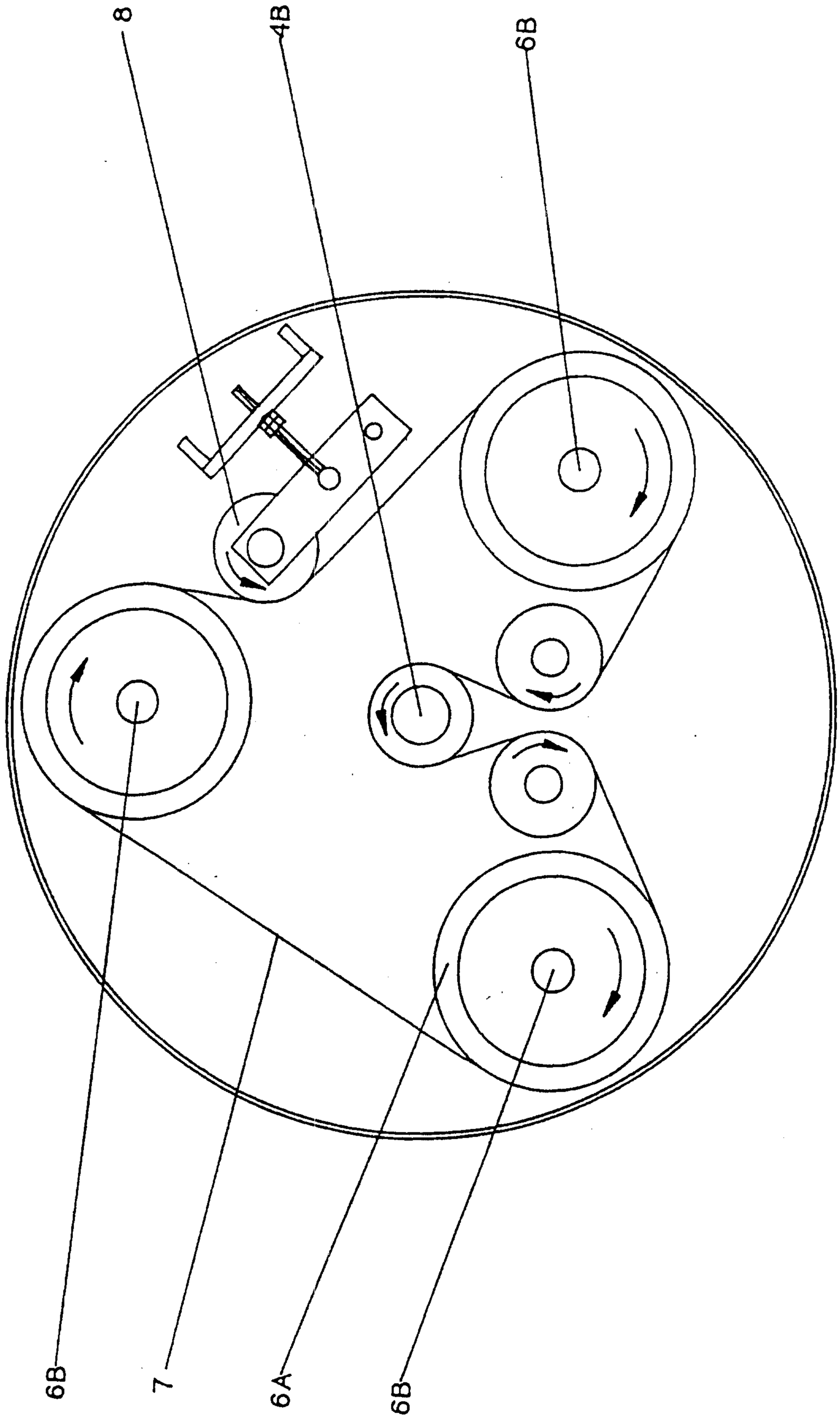



FIGURE 2

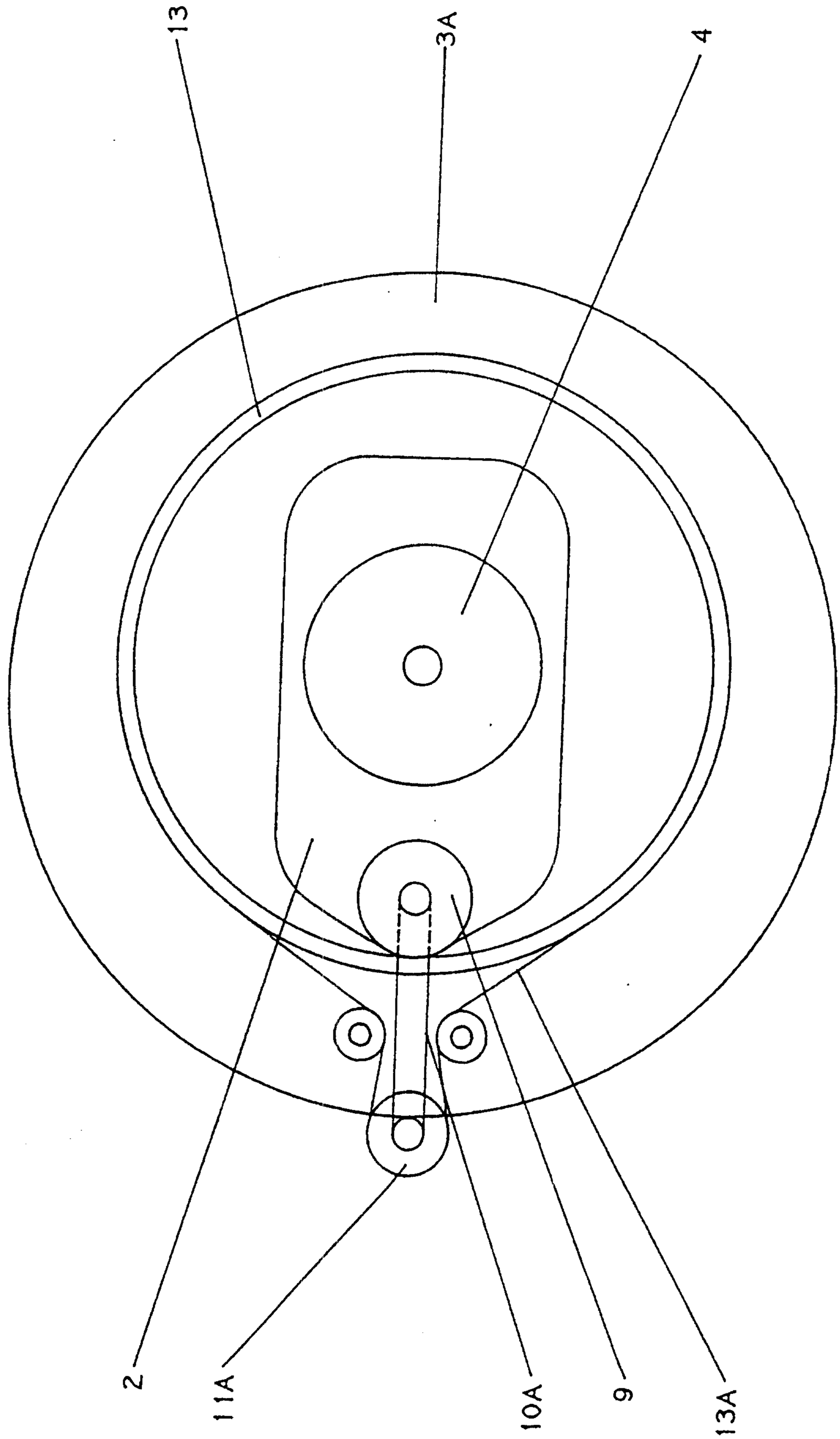
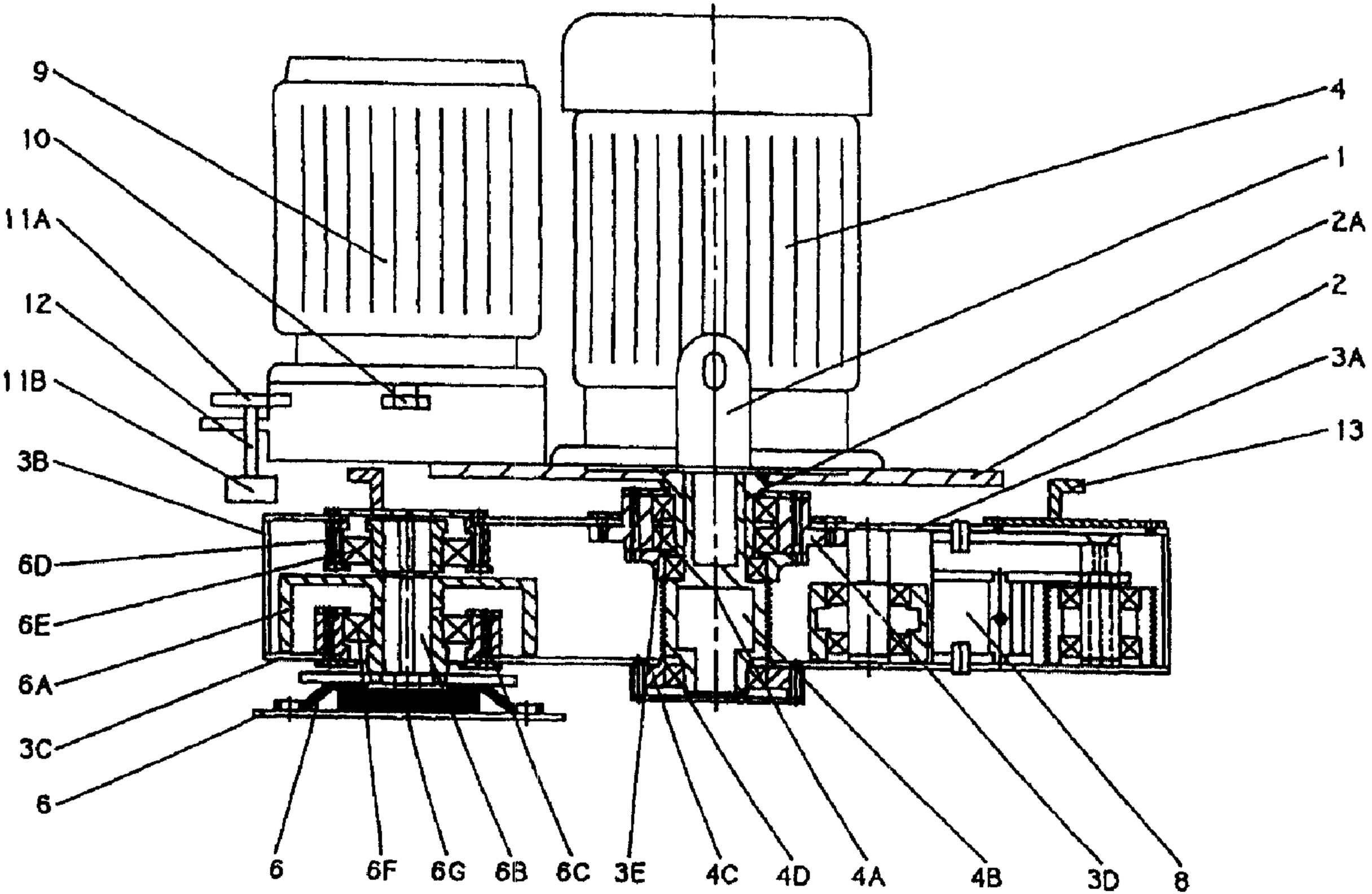



FIGURE 3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