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(54) Drive unit for draw benches.

(57) Drive unit for draw benches which is suitable to provide carriages (24) bearing draw grippers (27) with a required, coordinated to-and-fro movement, a radial cam (13) cooperating with each carriage (24) and pressing on a roller (14) borne on a first shaft (15) able to move axially with a first rack (16) with which a pinion (17) is engaged that is coaxial with and solidly fixed to a gearing-up gear wheel (18) acting on a second rack (25) included on the carriage (24), a desired preferred ratio existing between the pinion (17) and the gear wheel (18), the pinion (17) and gear wheel (18) having an axis which is rotary but not displaceable.

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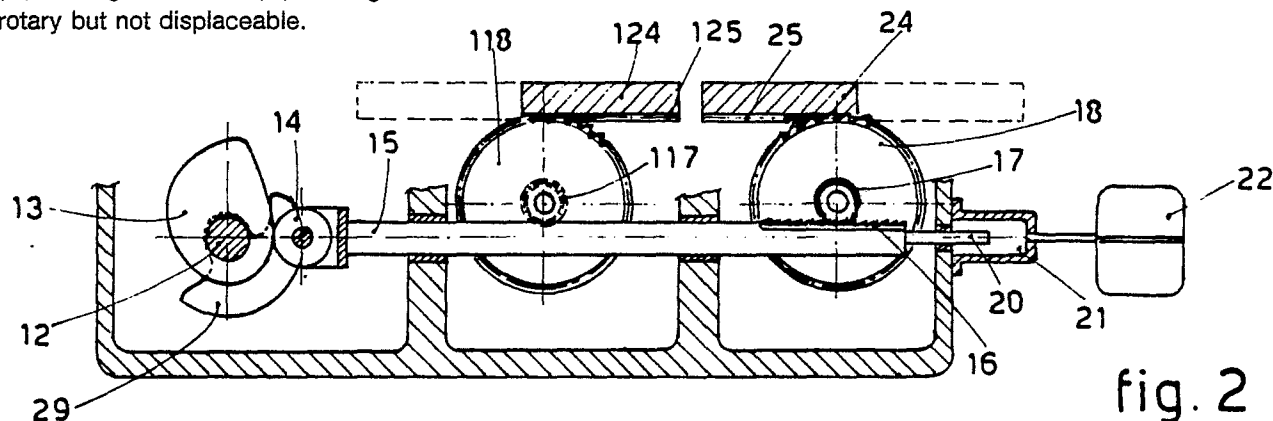


fig. 2

"DRIVE UNIT FOR DRAW BENCHES"

This invention concerns a drive unit for draw benches. The drive unit is an assemblage of elements on the draw benches which serves to provide the draw carriages with their to-and-fro movement and the necessary force.

The invention concerns the drive cams and the elements which transmit to the draw carriages their movement and the required force.

At the present time the drive cams consist of a drum-type cam having frontal contact between a path on the cam and a connecting roller. With the increase of power required and increase of speed such a type of cam entails very considerable dimensions.

Such increase in power and in the sizes of the cams involve a plurality of appreciable problems.

Firstly, a general problem of this type of drive is that it compels the various elements to work in a dry or substantially dry state.

Another general problem arises from the fact that the roller and frontal cam slide against each other owing to the varying peripheral speed of the path of the cam, such path being comprised between two different radii.

A third general problem with this type of drive is connected with the transverse component which drum-type cams create with frontal paths.

The modern requirements of greater power and bigger sizes entail the embodiment of very large axial cams with heavily inclined coils, and this fact makes even more evident the general problems cited above.

US 2,126,453 discloses two coaxial cams with a circumferential action, which act on complex levers that act directly on the draw grippers.

US 2,234,728 is an improvement of US 2,126,453.

GB 2,018,658 discloses circumferential cams acting on levers, which in turn operate the draw grippers.

GB 824,056 discloses a complex system of gears in association with free wheels, the gears providing motion for the carriages bearing the grippers.

US 3,693,395 discloses drum-type cams the profile of which serves to drive the gripper-bearing carriage directly.

The present applicant has studied and embodied this invention so as to overcome such drawbacks and obtain a further plurality of advantages.

Besides overcoming the general and particular problems indicated above and further problems which will become clear in the following description, the invention enables simpler cams to be produced by employing a harder material (the known art now requires frontal cams to be made of cast steel, thus limiting the choices available).

The invention enables also a better balancing and equalising of the whole system to be obtained when the motion is inverted.

Moreover, a greatly reduced overturning torque on the carriage is also obtained.

Furthermore, the maximum specific pressure between the roller and cam is lower since contact between the two elements is maintained in a correct manner.

Besides the above, the invention enables a drive in an oil bath or with force feed lubrication to be obtained, together with the considerable advantages produced thereby.

The invention provides an open, radial cam, which is called tangential or harmonic in some quarters and comprises on its periphery a rolling path on which a roller presses.

Such roller is connected to a shaft which actuates by means of a first rack a pair of coaxial gear wheels solidly fixed together and having a preferred ratio to each other.

The gear wheel not engaged with the first rack acts on a second rack comprised on a draw carriage.

In a variant two gear wheels not engaged with the first rack may be provided so as to balance better the stress transmitted to the carriage.

In another variant, where the ratio between the two gear wheels is 1:1, such wheels may be associated in only one gear wheel.

In a further variant, which is described here but not illustrated hereinafter, the shaft acts on a lever, which may have one or two arms and is connected at its end to the carriage in such a way that it can oscillate.

In yet another variant the roller is associated directly with the aforesaid lever.

Such lever performs the same functions as the system which comprises a first rack on the shaft, a pair of gear wheels and a second rack on the draw carriage.

The cam-roller-shaft-etc. system is normally duplicated so as to have one carriage moving forward in the drawing step, while there is another carriage in the return step, such carriages holding the coaxial drawing grippers.

The invention is therefore embodied with a drive unit for draw benches which is suitable to provide carriages bearing draw grippers with a required, coordinated to-and-fro movement, a radial cam cooperating with each carriage and pressing on a roller borne on a first shaft able to move axially with a first rack with which a pinion is engaged that is coaxial with and solidly fixed to a gearing-up gear wheel acting on a second rack included on the carriage, a desired preferred ratio existing between the pinion and the gear wheel, the pinion and gear wheel having an axis which is rotary but not displaceable.

Let us now see a preferred embodiment of the invention with the help of the attached figures, which provide a non-restrictive example and in which:

Fig.1 shows an embodiment according to the invention from above;

Fig.2 gives a side view of the embodiment of Fig.1;

Fig.3 shows a vertical section of the embodiment of Fig.1;

Fig.4 shows a variant of Fig.3.

In the figures a motor 10 is connected to a gearing-down unit 11 which transmits motion to a cam shaft 12. In the example shown two cams 13-113 are fitted to the cam shaft 12 and counterweights 29 are provided. Such cams 13-113 may also be machined on the cam shaft 12 and be a part thereof.

The cams 13-113 are of a radial type, or tangential type as otherwise denominated, and the path on them for cooperation with rollers 14-114 respectively is located on their circumferential periphery. The result of this is that cooperation between path and roller is the best possible, without different and simultaneous instantaneous peripheral speeds.

The rollers 14-114 cooperate with a first shaft 15-115 supported and guided axially by bearings 19 in the draw bench.

The first shaft 15-115 may comprise elements to prevent rotation and springs to keep the respective roller 14-114 pressed against its respective cam 13-113.

A first rack 16-116 is comprised on the shaft 15-115 and cooperates with a pinion 17-117, which is, or is caused to be, solidly fixed to a second shaft 23-123, to which a toothed wheel 18-118 is also solidly fixed.

In a variant the second shaft 23-123 may comprise two toothed wheels 18-118, which are respectively referenced with A and B.

A determined ratio, selected as required during design work and dimensioning, is established between the toothed wheel 18-118 and pinion 17-117.

In a variant a system to store and recover energy is comprised at the end of or in cooperation with the first shaft 15-115 and may be a mechanical system with a spring or a hydraulic or combined system.

In the example shown the system to store and recover energy consists of a plunger 20 cooperating with a chamber 21, which in turn cooperates with a hydraulic storage reservoir 22.

When the plunger 20 is thrust into the chamber 21, energy is stored and is returned when the thrust action stops.

The toothed wheel 18-118 (or the toothed wheels 18A-18B-118A-118B in the variant) cooperates with a second rack 25-125 comprised on a carriage 24-124 holding draw grippers 27 which act on rod 30 being drawn.

Means 28 to store and recover energy may be provided in cooperation with the draw carriages 24-124 and may consist, for instance, of springs or hydraulic means.

The whole assemblage is contained in a suitably formed box-wise structure 26, which enables the system to be lubricated plentifully without any loss or waste of oil.

As said earlier, the actuation assemblage may consist also of a lever, so that instead of the first rack 16, pinion 17, toothed wheel 18 and second rack 25 one lever may be provided in cooperation with the first shaft 15 and carriage 24 and be supported by the structure so as to be able to oscillate.

In a variant such lever bears the roller 14 and is actuated directly by the cam 13.

If it is desired to improve the performance of the unit, it is possible to arrange for the carriage 24 to cooperate with hydraulically supported slide blocks 31.

Claims

1 - Drive unit for draw benches which is suitable to provide carriages (24) bearing draw grippers (27) with a required, coordinated to-and-fro movement, a radial cam (13) cooperating with each carriage (24) and pressing on a roller (14) borne on a first shaft (15) able to move axially with a first rack (16) with which a pinion (17) is engaged that is coaxial with and solidly fixed to a gearing-up gear wheel (18) acting on a second rack (25) included on the carriage (24), a desired preferred ratio existing between the pinion (17) and the gear wheel (18), the pinion (17) and gear wheel (18) having an axis which is rotary but not displaceable.

2 - Drive unit as claimed in Claim 1, which comprises two gear wheels (18) that act on second racks (25) included on the carriage (24).

3 - Drive unit as claimed in Claims 1 and 2, in which means to store and recover energy are associated with the carriage (24).

4 - Drive unit as claimed in any claims hereinbefore, in which the means to store and recover energy are mechanical (springs). 5

5 - Drive unit as claimed in any of Claims 1 to 3 inclusive, in which the means to store and recover energy are hydraulic.

6 - Drive unit as claimed in any claim hereinbefore, in which the means to store and recover energy comprise air springs. 10

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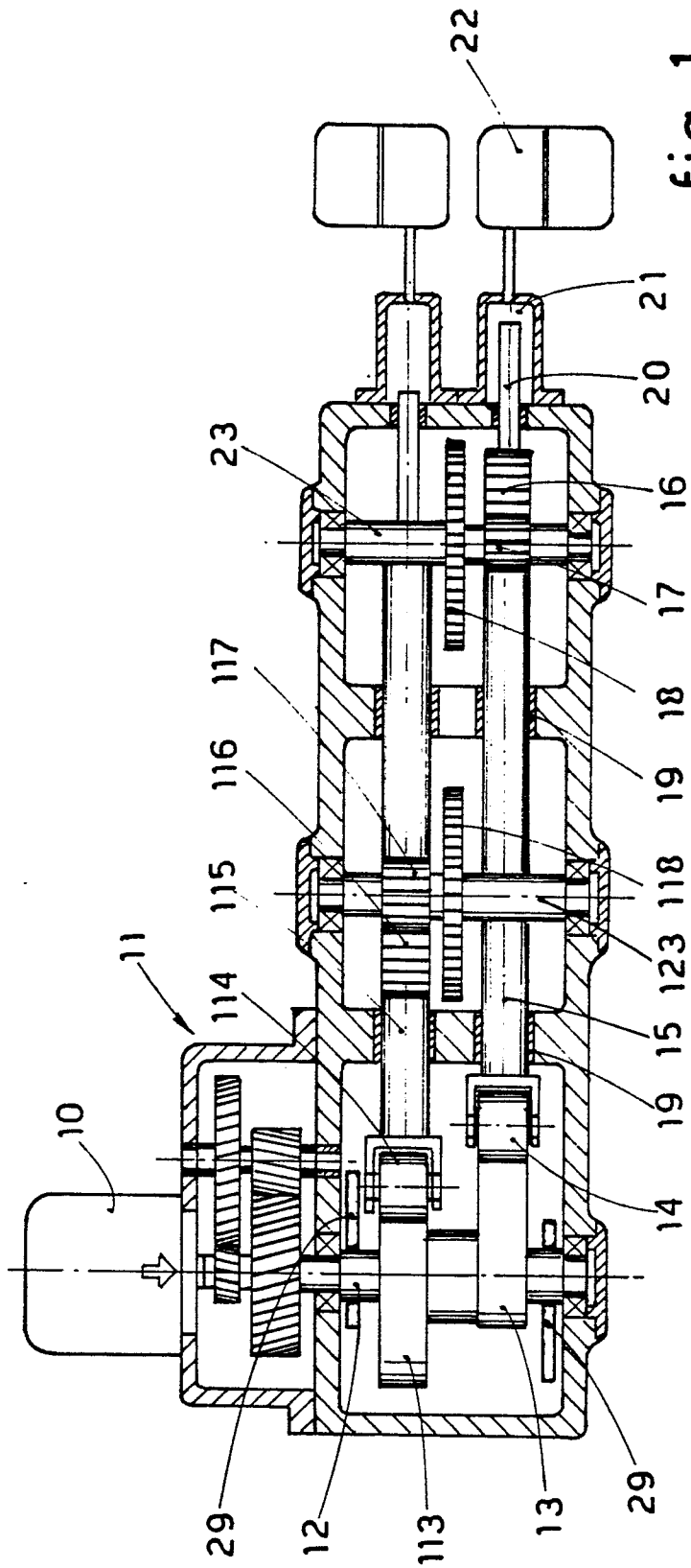


fig. 1

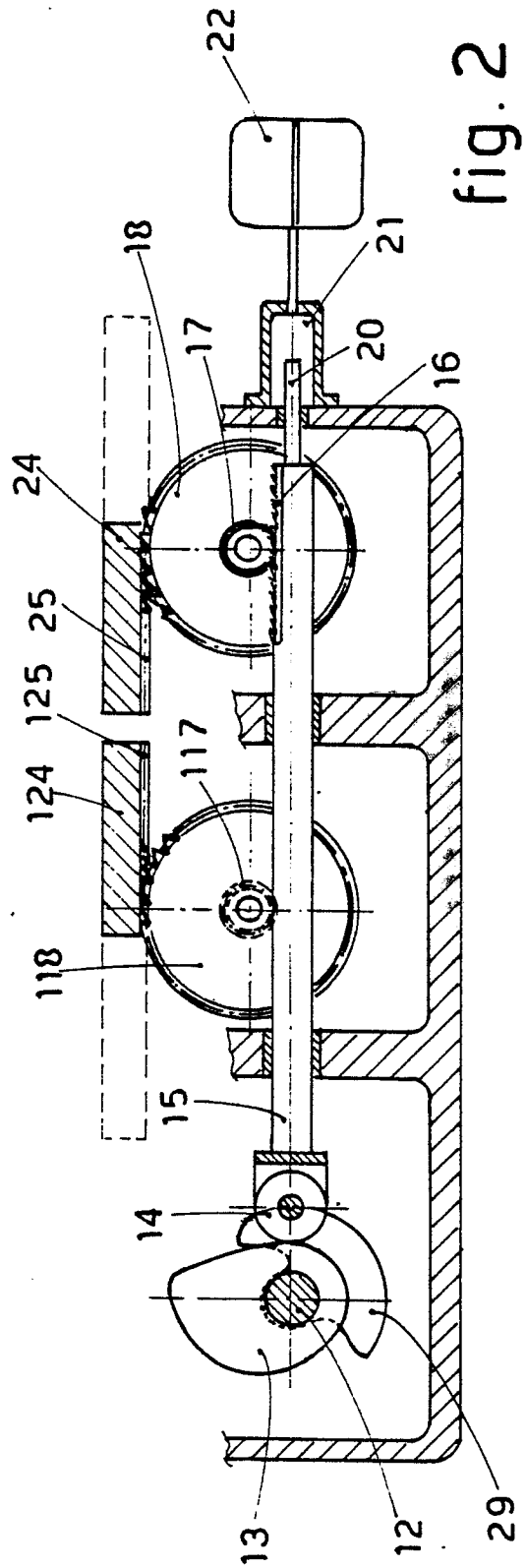


fig. 2

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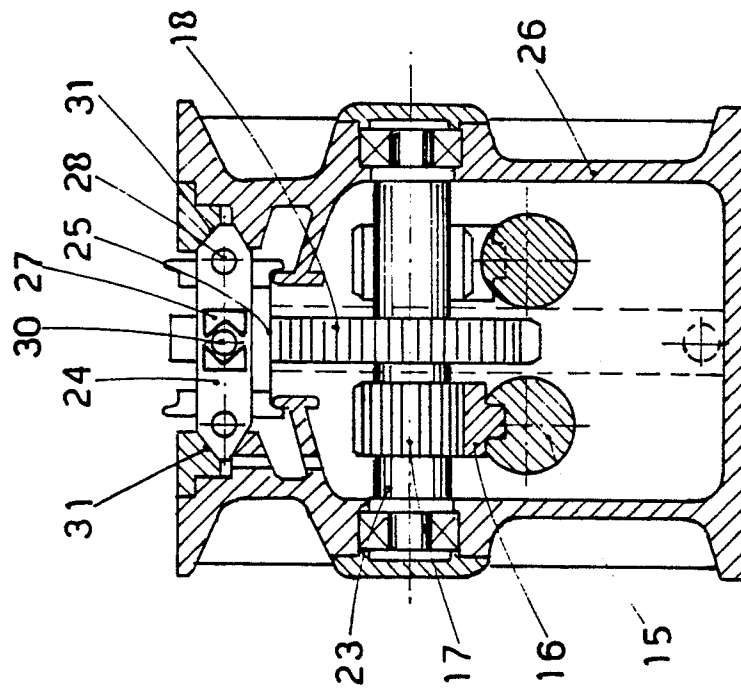


fig. 3

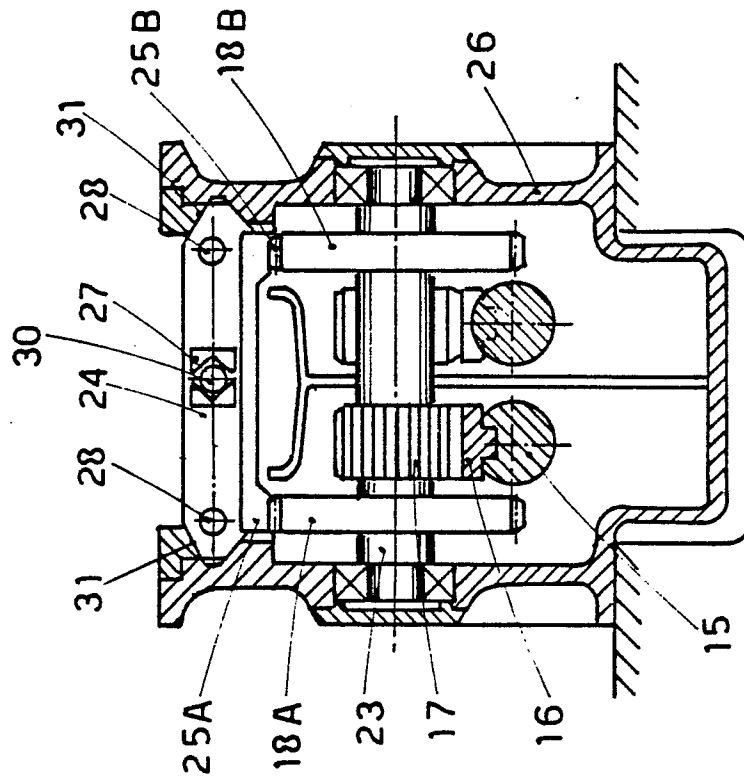


fig. 4

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,A	GB-A- 824 056 (SINGER) * Page 2, lines 98-128; figures 1-4 *	1,2	B 21 C 1/30
D,A	--- US-A-3 693 395 (GREVEN) * Column 7, line 56 - column 9, line 28; figures 1-5 *	1,2	
D,A	--- US-A-2 126 453 (CRILEY) * Page 3, left-hand column, lines 55-68; figure 2 *	4	
D,A	--- US-A-2 234 728 (GAINES) * Page 2, right-hand column, lines 49-65; figure 1 *	4	
D,A	--- GB-A-2 018 658 (MANNESMANN)		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	--- DE-C- 444 479 (HELSPER)		B 21 C
A	--- EP-A-O 001 073 (OSWALD FORST MASCHINENFABRIK) -----		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		13-10-1987	THE K.H.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	