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(54) DRIVING ENGINE (WATER TURBINE) OF HYDROKINETIC FLOATING POWER PLANT WITH ENHANCED EFFICIENCY DEGREE, AND HYDROKINETIC FLOATING POWER PLANT MODULE

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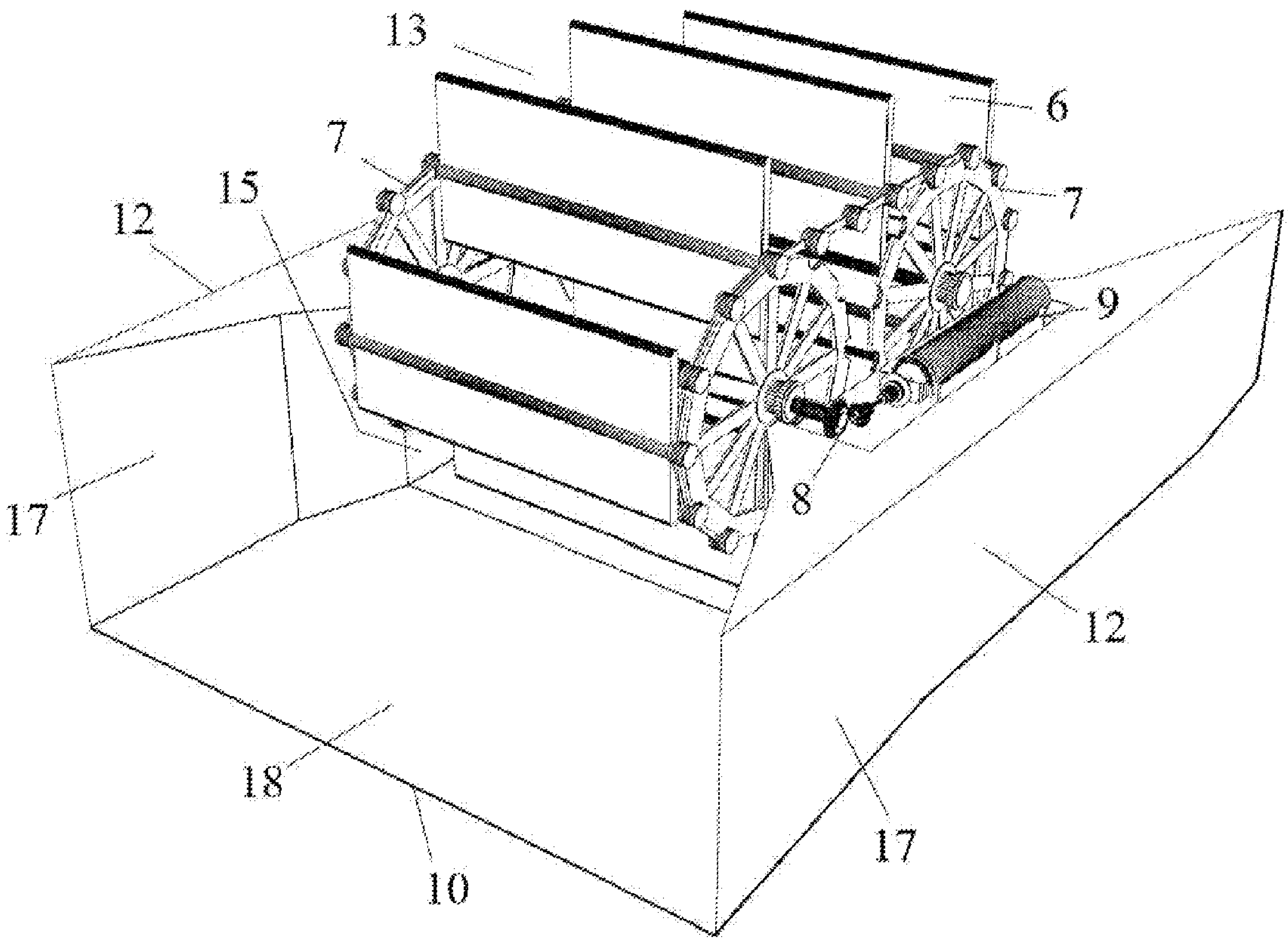
(57) **ABSTRACT**

Improvements in hydrokinetic floating power plant efficiency are obtained by optimization of (1) gaps z and z' between the hydrokinetic driving engine blades and internal sidewalls and floor of the working channel of the driving engine; (2) the ratio of the submerged part of blade height in liquid and part of blade height above the liquid surface; (3) the angles of inlet side planes and bottom planes of a confusor and the outlet side planes of the diffusor; and (4) distance t between blades and number n simultaneously submerged blades in the working channel of the driving engine.



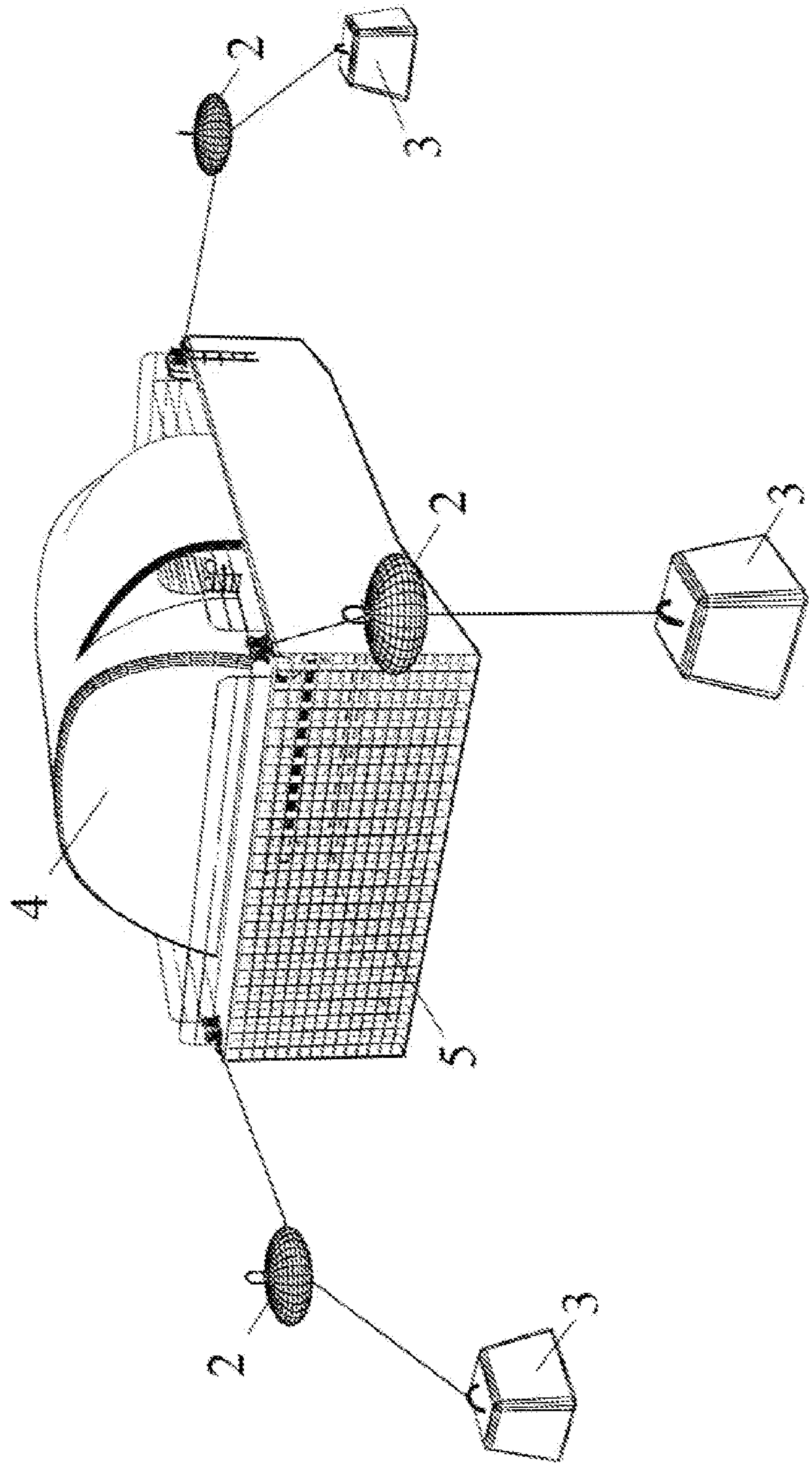


FIG. 1

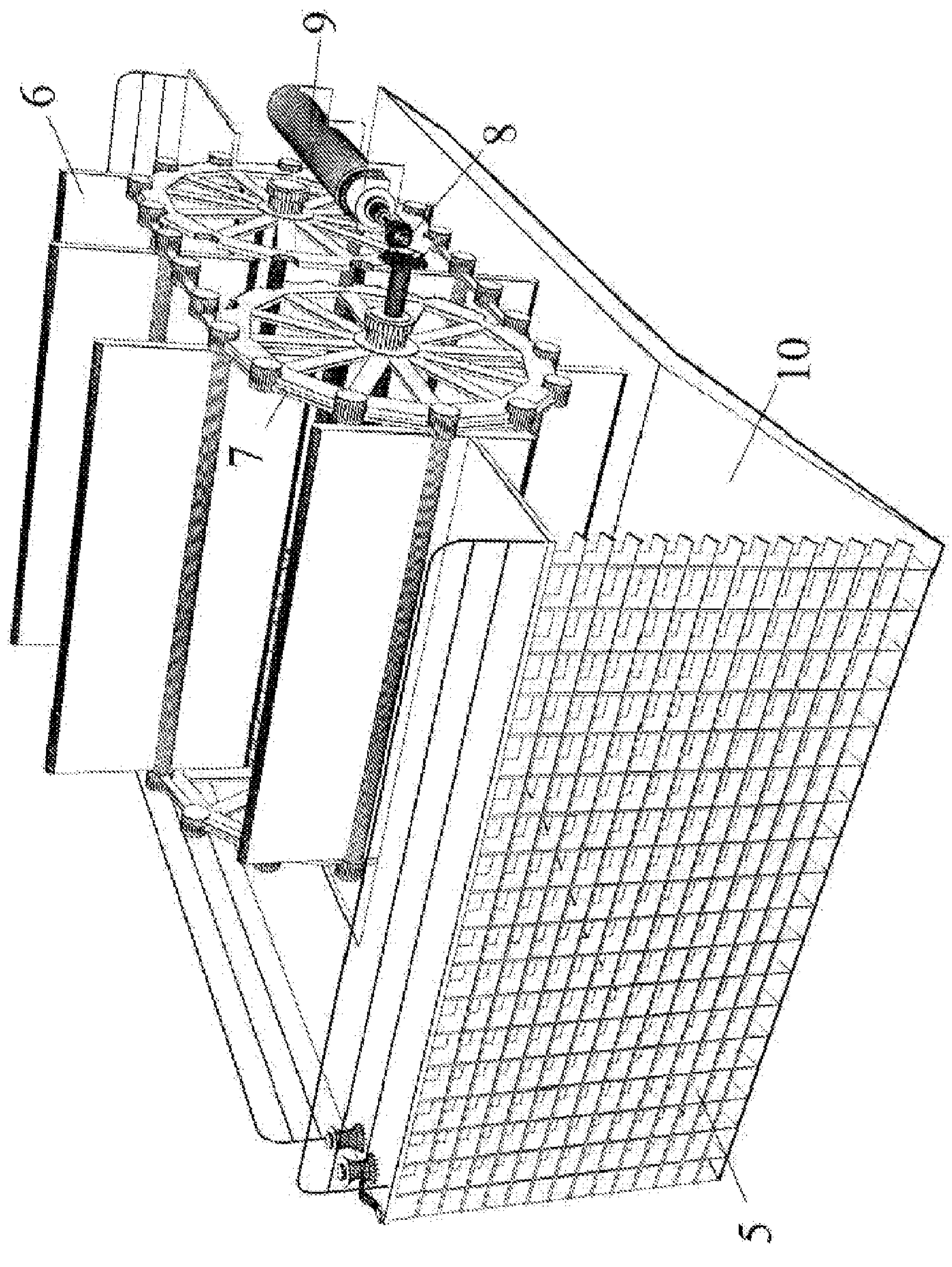


FIG. 2

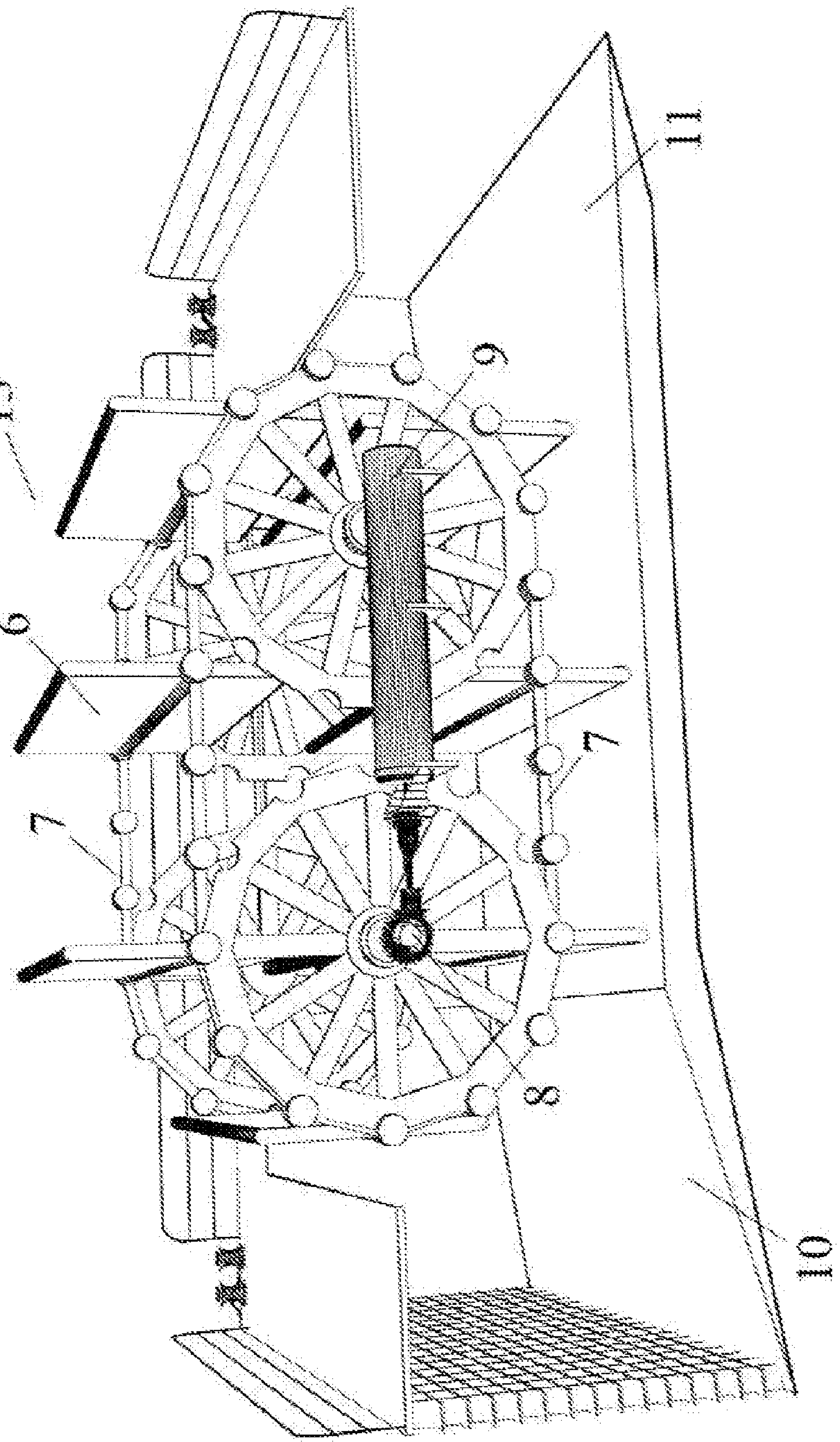


FIG. 3

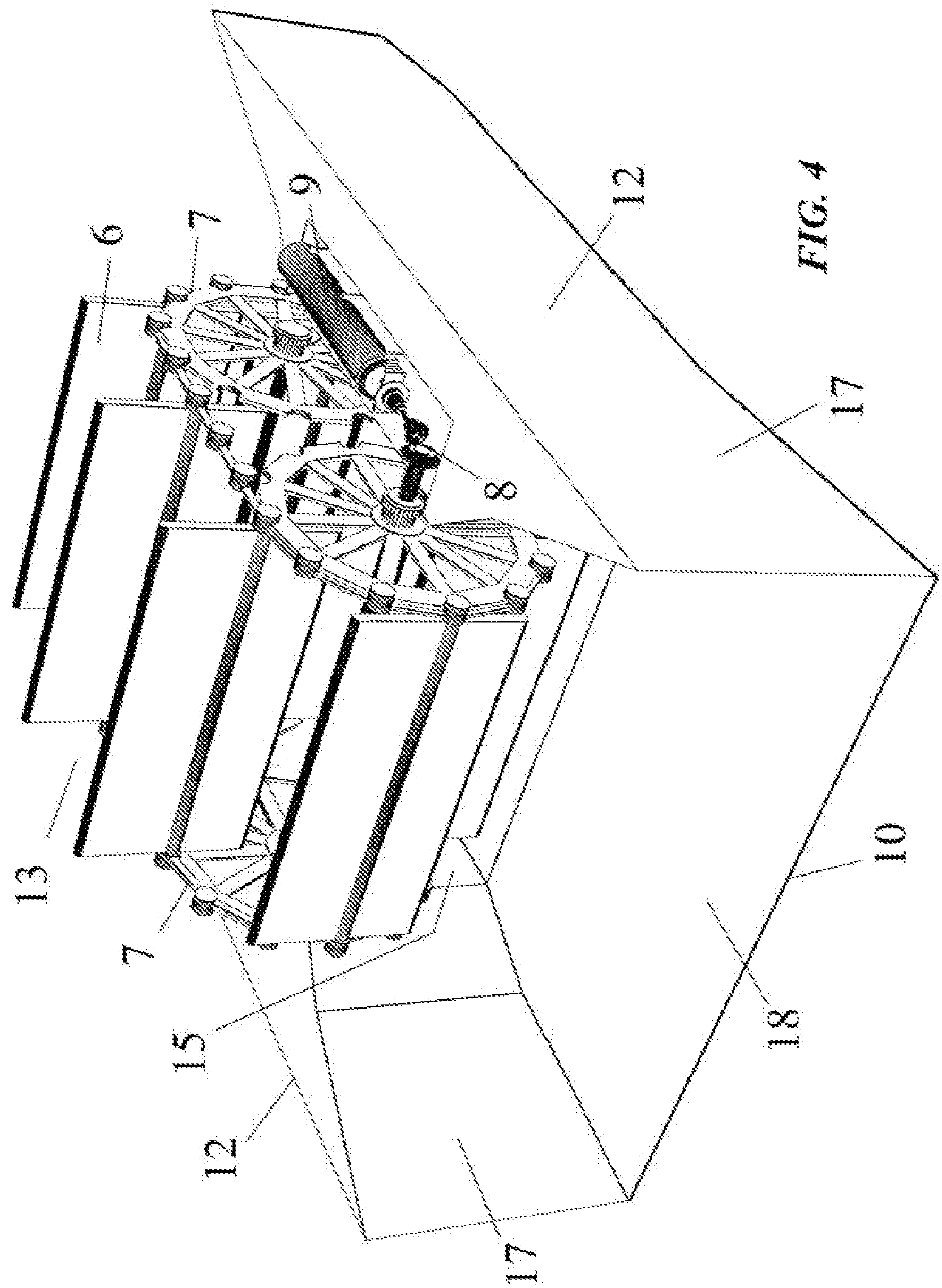


FIG. 4

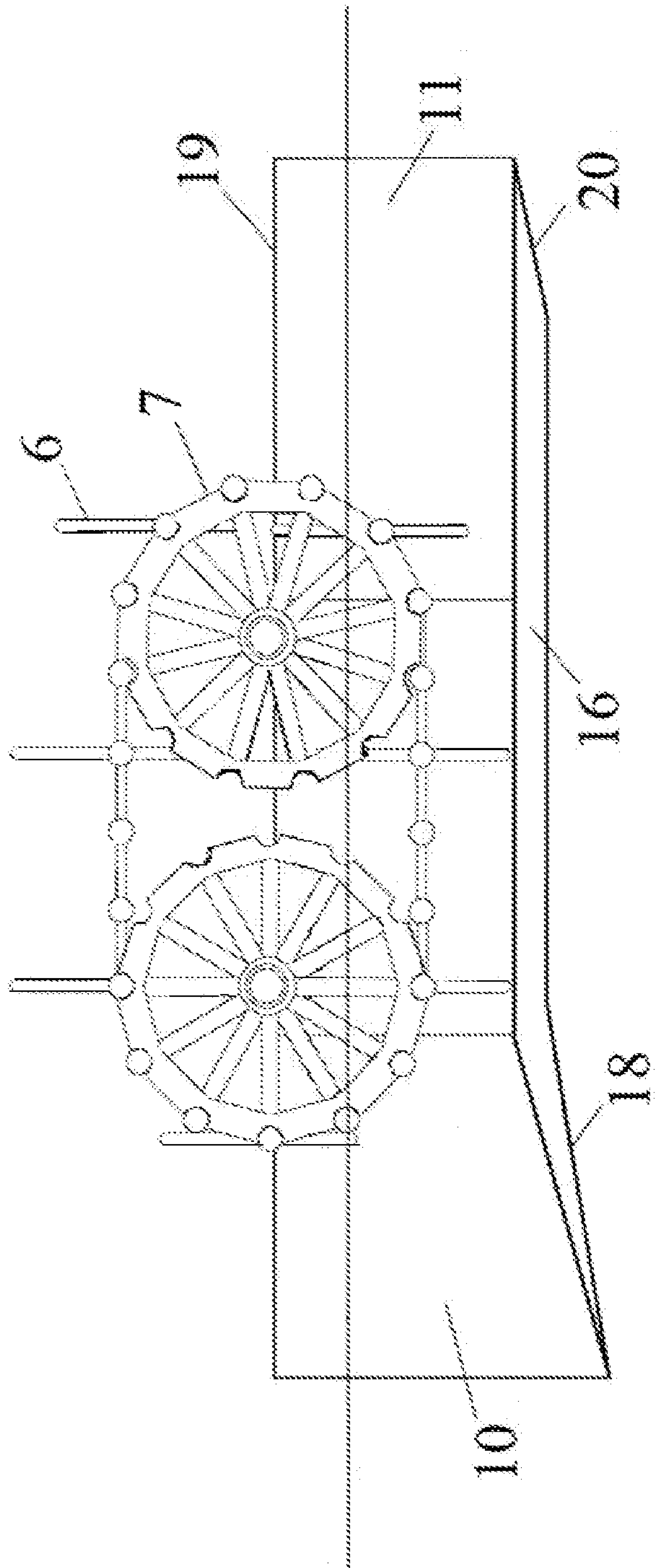


FIG. 5

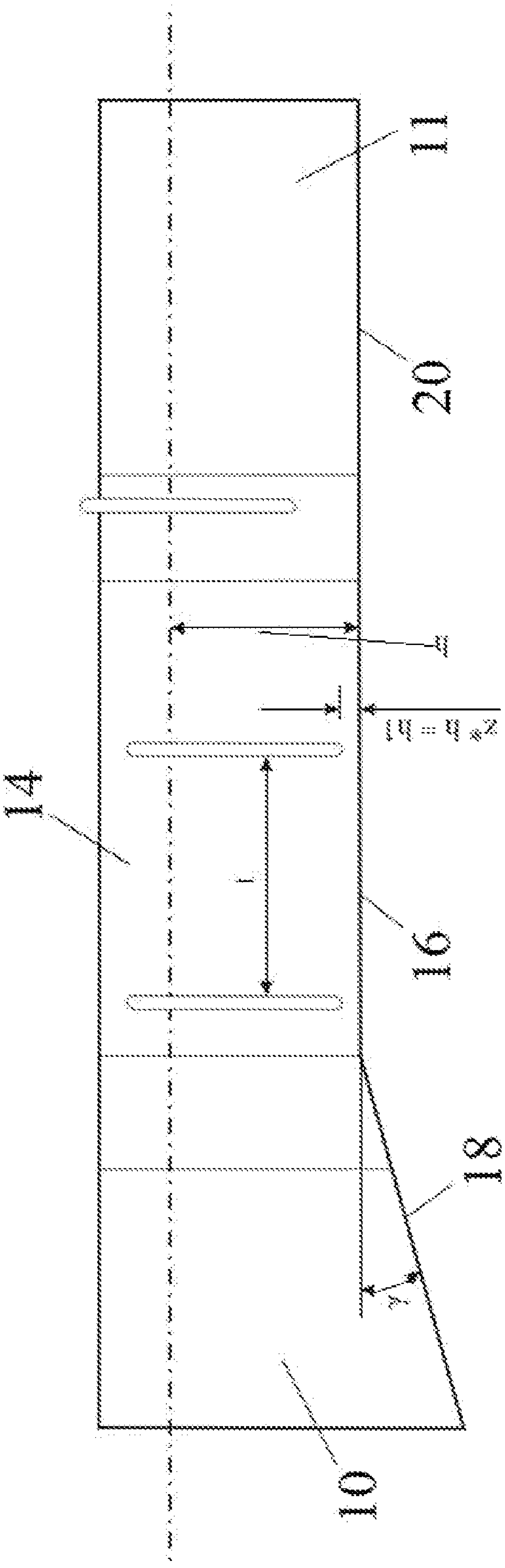


FIG. 6

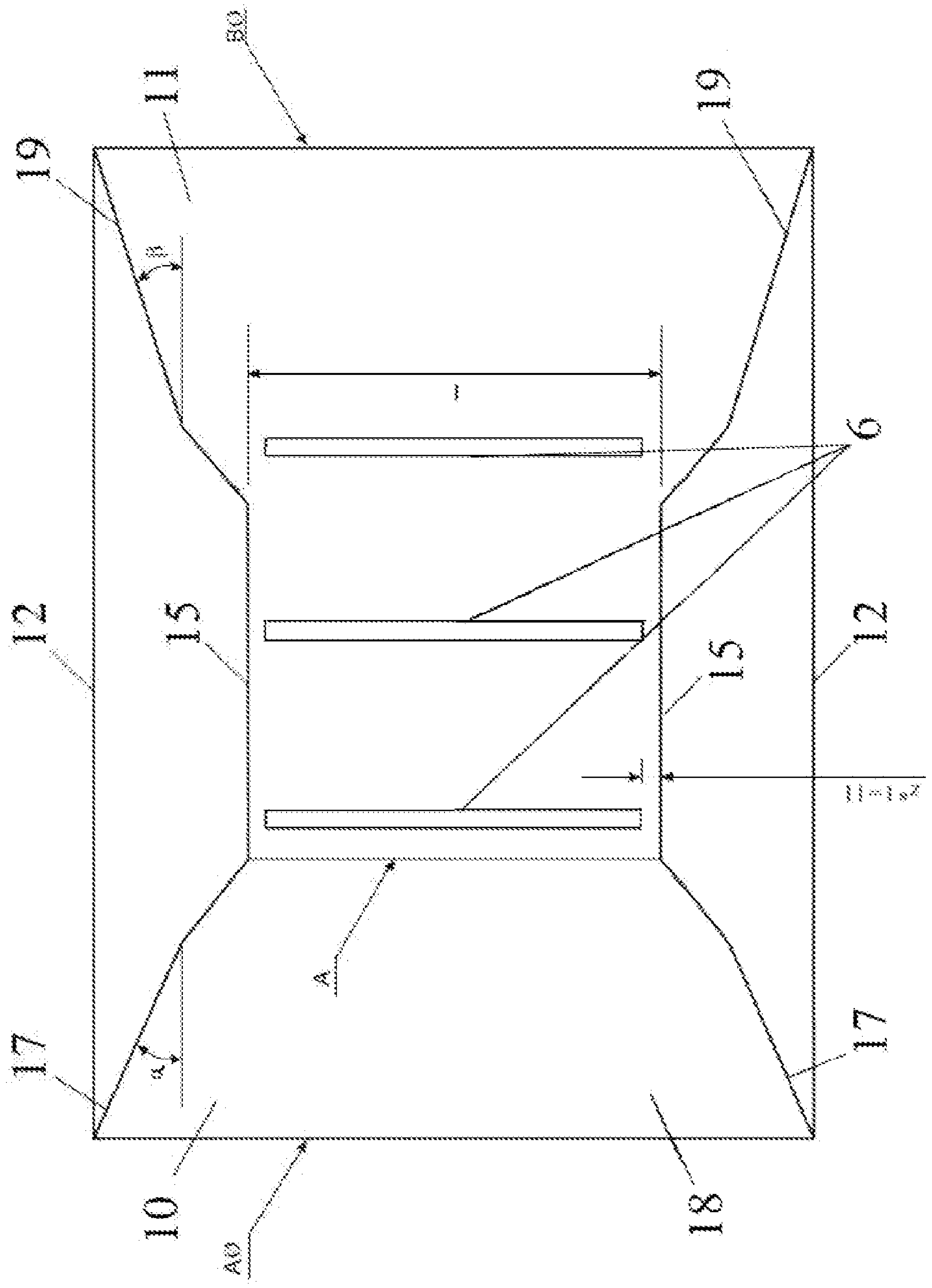


FIG. 7

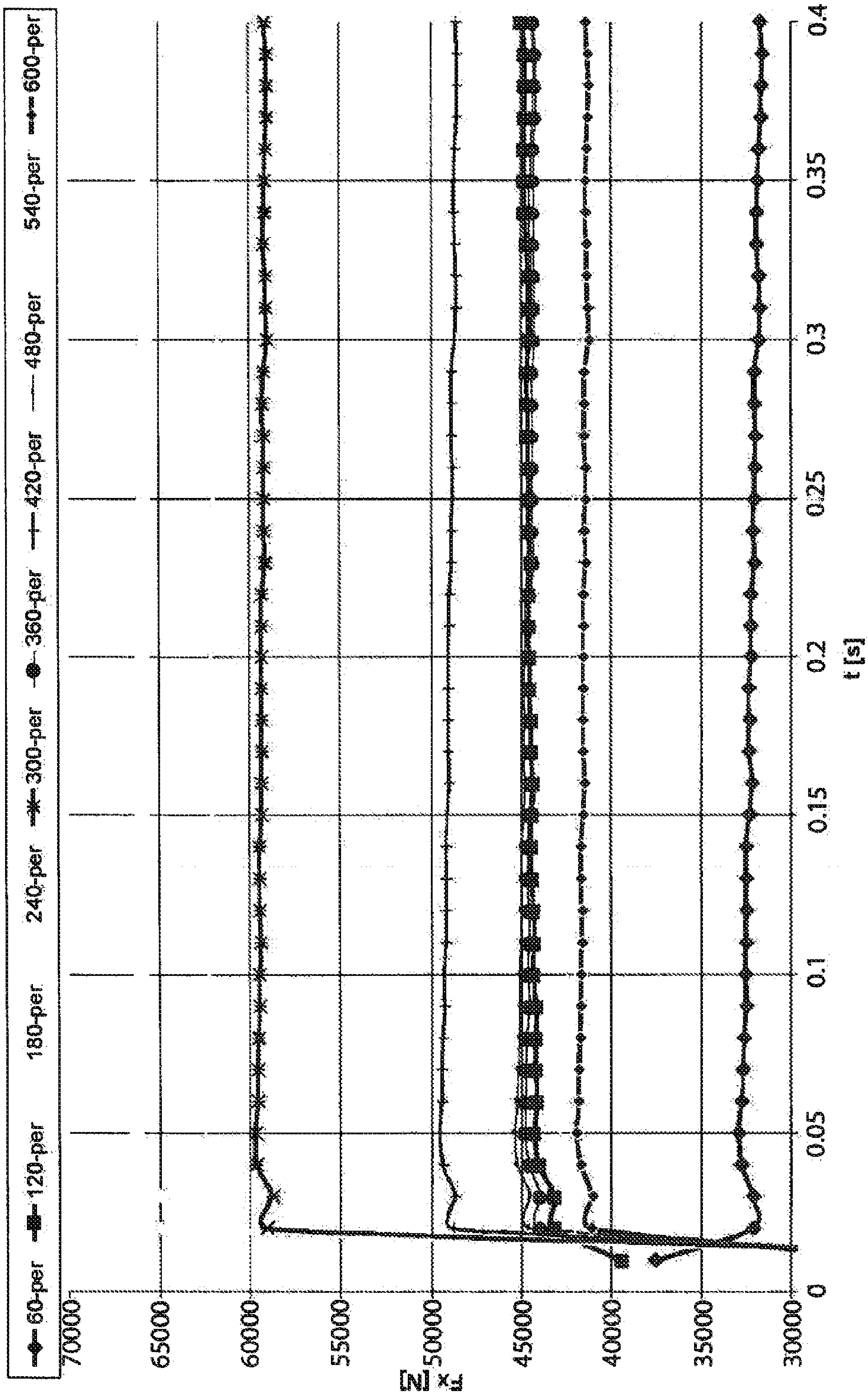


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FIG. 8

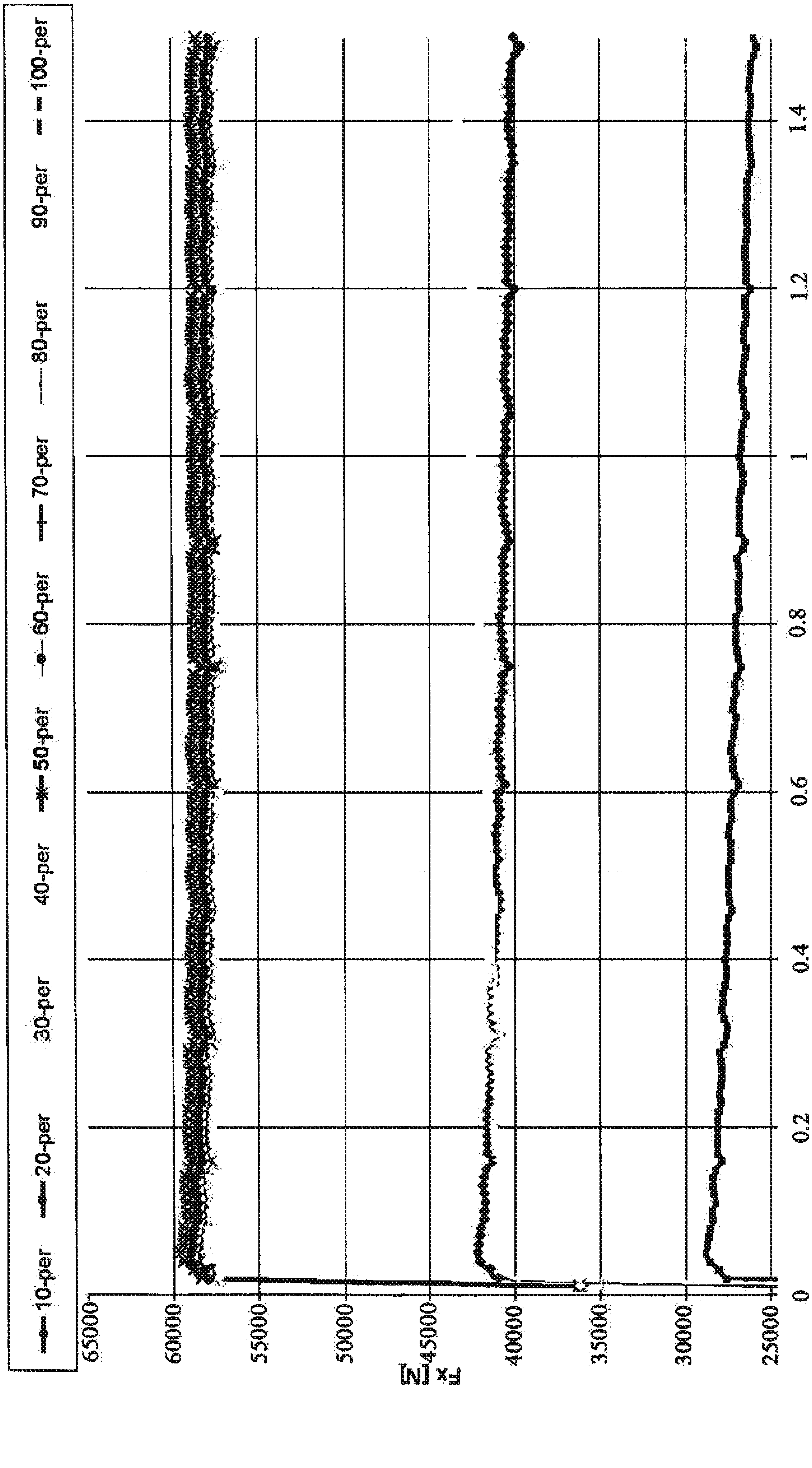
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FIG. 9

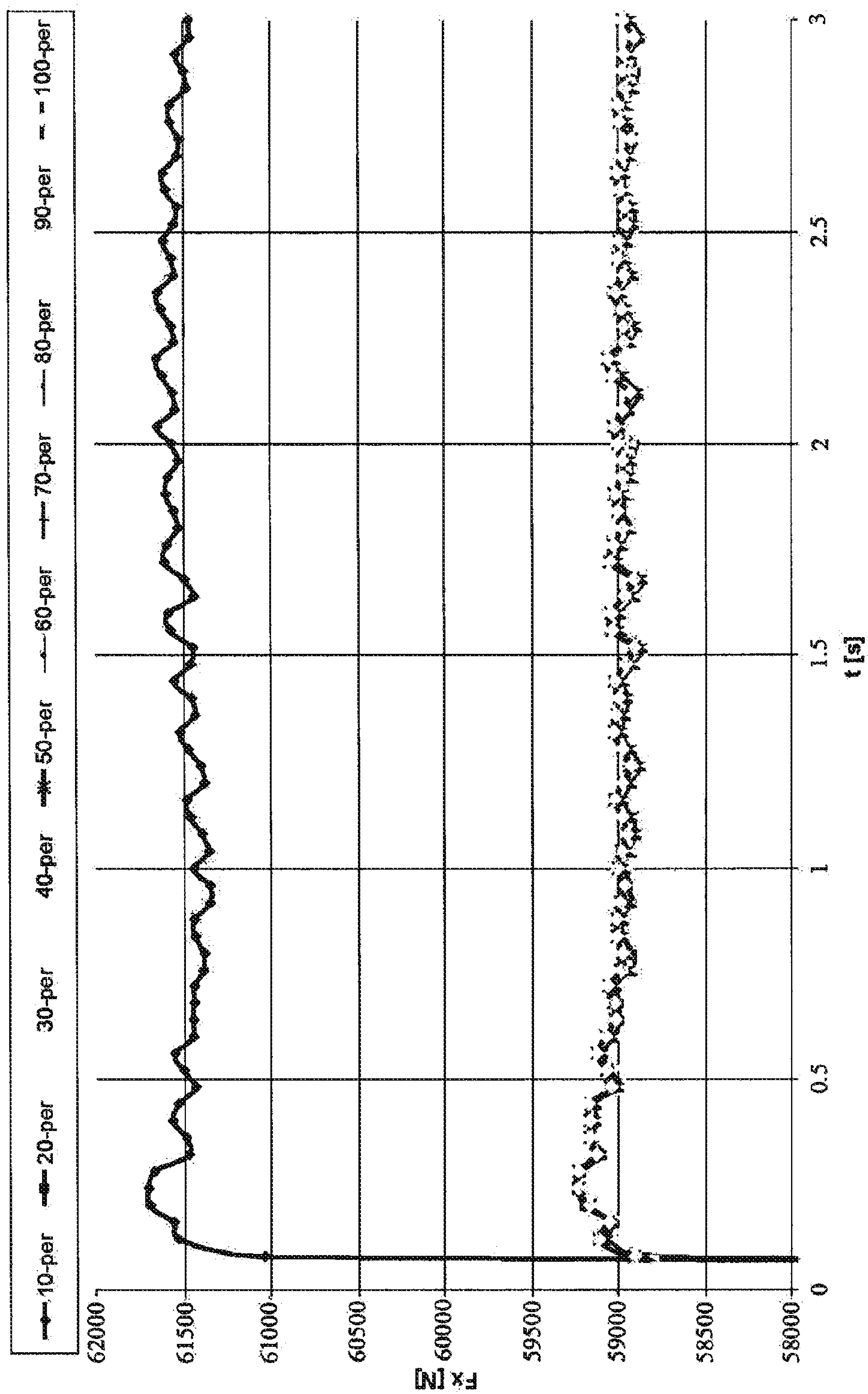
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FIG. 10

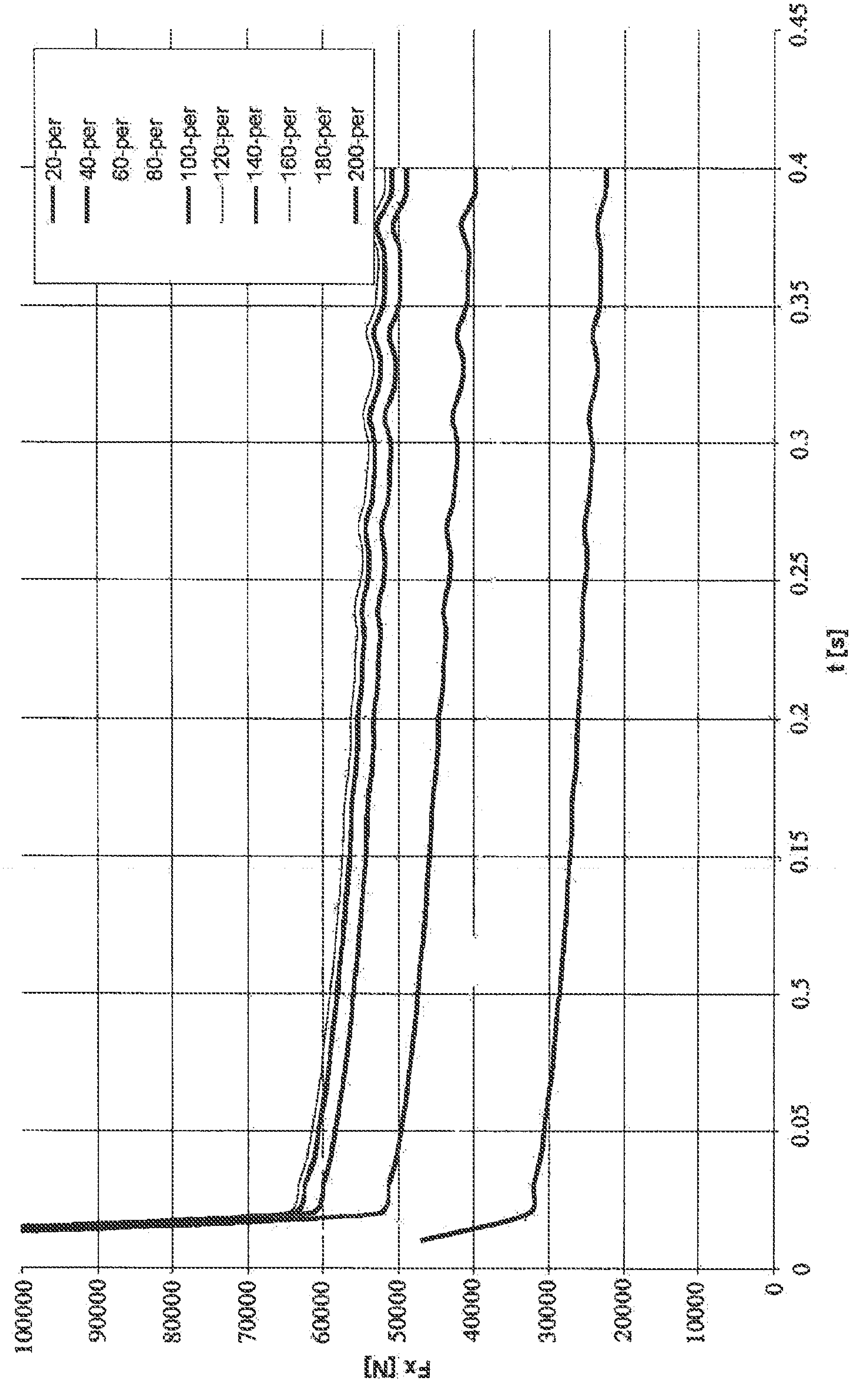

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FIG. 11

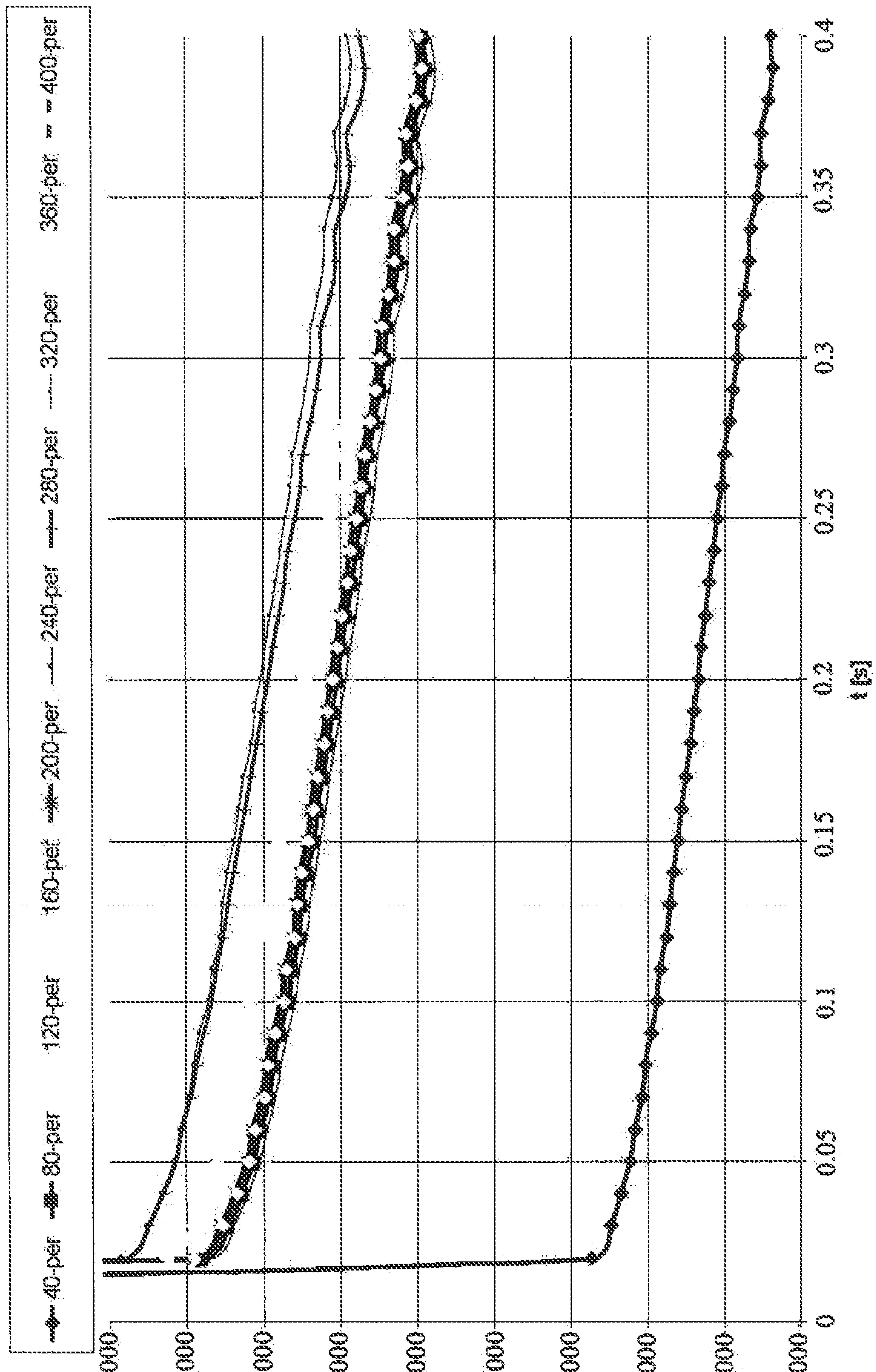
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FIG. 12

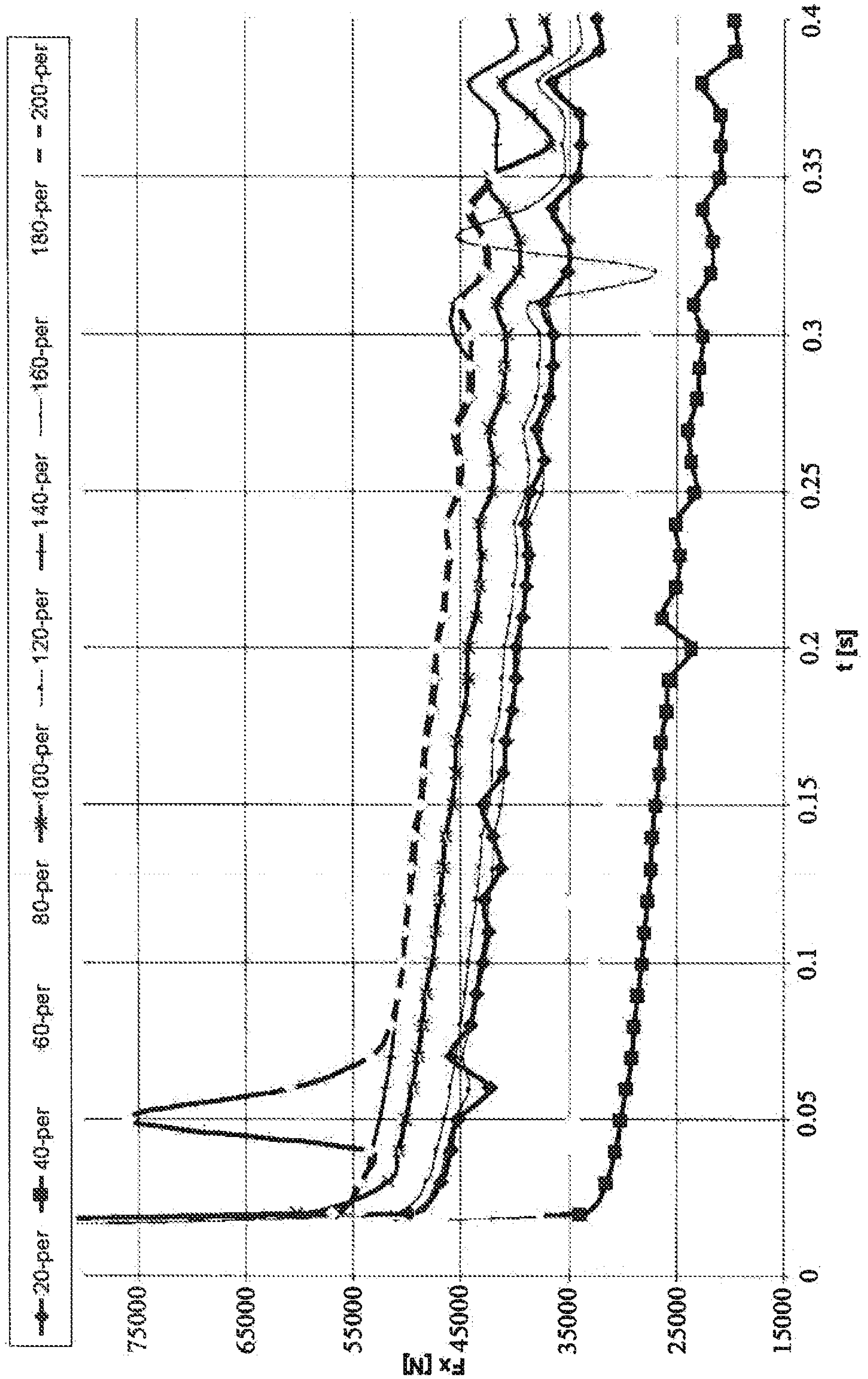
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FIG. 13

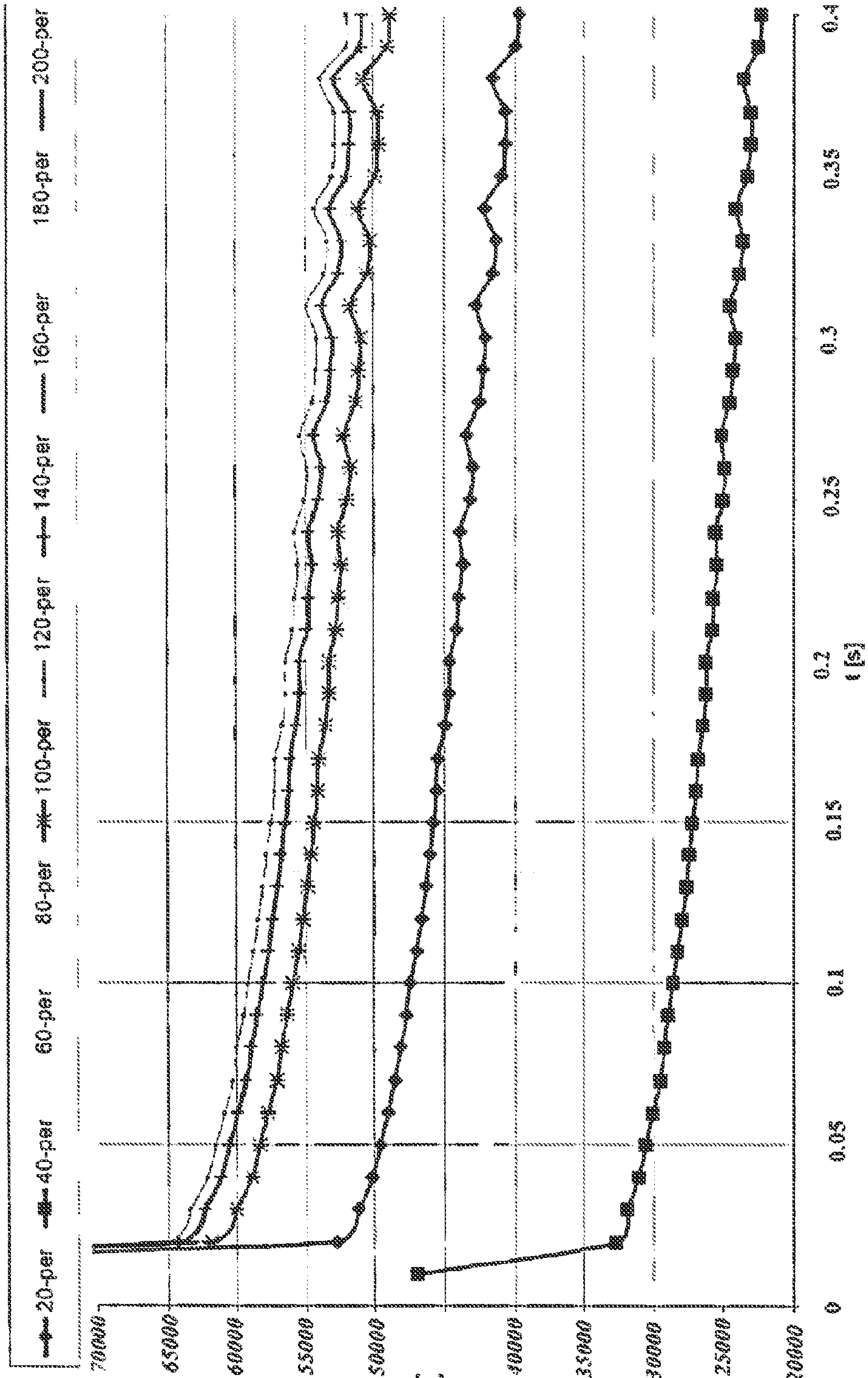
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FIG. 14

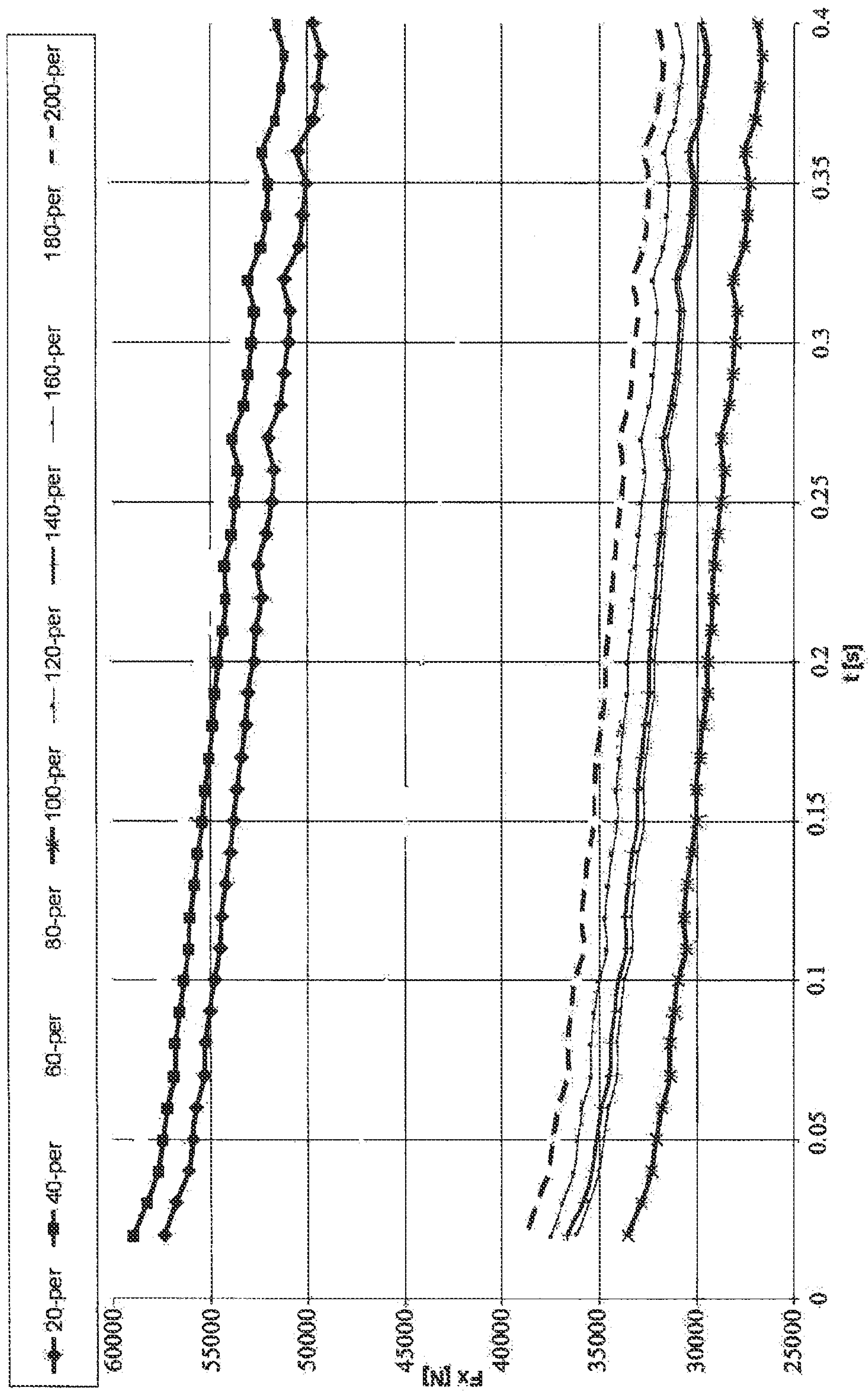
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FIG. 15

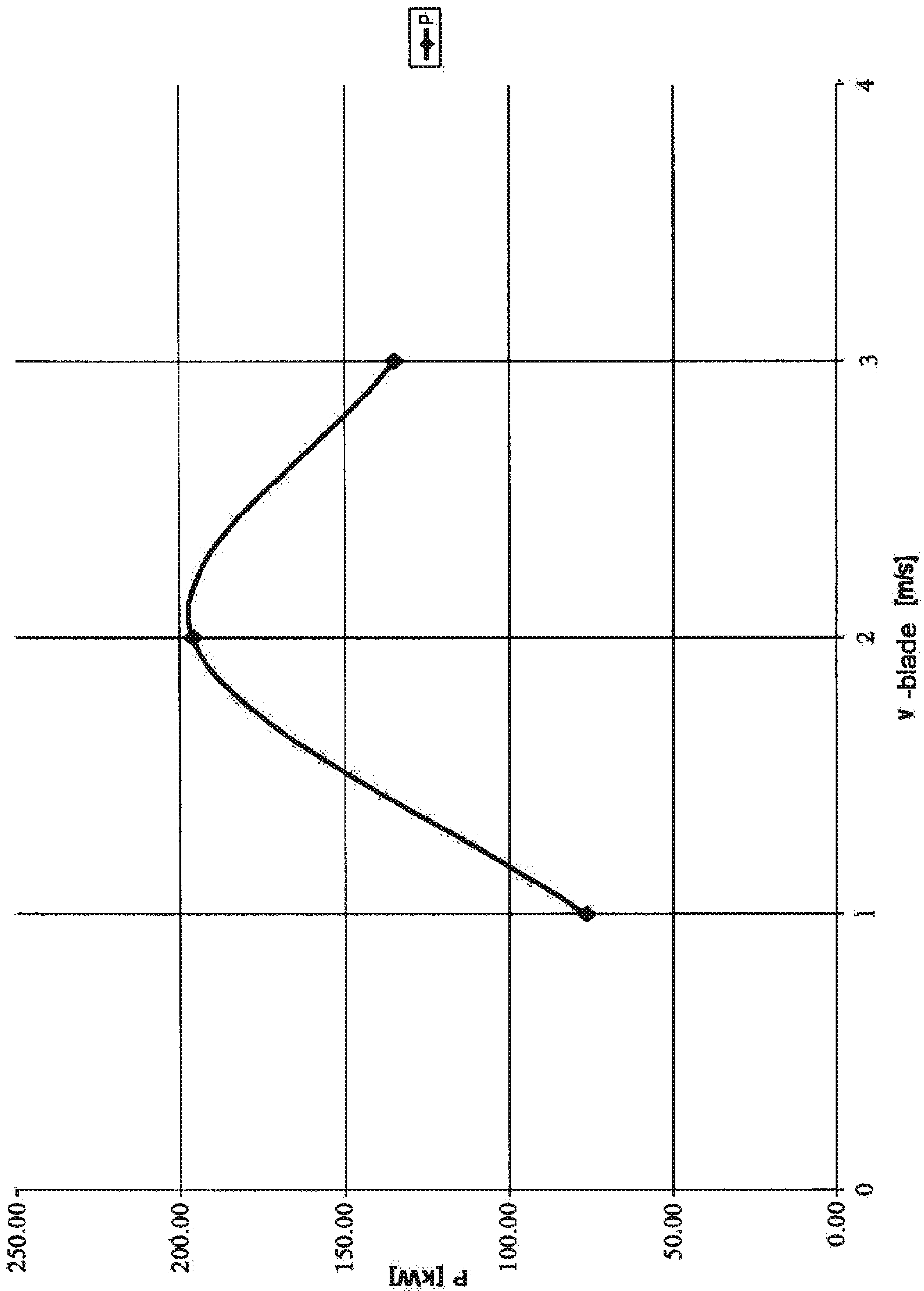

FIG. 16

DRIVING ENGINE (WATER TURBINE) OF HYDROKINETIC FLOATING POWER PLANT WITH ENHANCED EFFICIENCY DEGREE, AND HYDROKINETIC FLOATING POWER PLANT MODULE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present Application is a continuation of pending International Patent Application PCT/HR2010/000004 filed on Feb. 22, 2010, which designates the United States, and the content of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention is a hydrokinetic engine for a hydrokinetic floating power plant with enhanced efficiency, and a hydrokinetic floating power plant module for electric power generation, which uses the kinetic energy of river water flow. In particular, the invention relates to a water engine with improved individual element parameters that provide increased water flow efficiency in the water engine working channel improved power generation output of the hydrokinetic floating power plant module.

[0003] The invention is referred to technical field which is according to International patent classification (IPC) designated under No. FO3B9/00 and refers to driving engines for liquids driven by endless chain.

BACKGROUND OF THE INVENTION

[0004] All known technical solutions in the field of kinetic energy usage of hydrodynamic flow of fluids recover only a portion of the moving fluid's energy. Heretofore, no effective solutions have been proposed which would increase the efficiency of energy recovery in a hydrokinetic engine.

[0005] Since the existing technical solutions have typically exhibited low efficiency, such systems have not been widely used since they lack the needed commercial cost effectiveness.

[0006] DE102007003323A1 discloses a device with multiple blades submerged in water. The blade's plane is perpendicular to water flow direction. The blades are connected by means of a wheel parallel to flow. Blades are fixed to transmission device which transfer longitudinal movement of blades to rotating generator shaft.

[0007] FR2532364 discloses a hydroelectric power plants using water power as source of energy where force is acting in direction of rotation of the half of blades and not perpendicular as it is with most of hydroelectric power plants. A hydroelectric power plant is located at the most suitable location where water is flowing with a sufficient stream for electric power generation and without having impact on fish migration and requirements for larger intervention. The device can be completely manufactured in a factory. It includes two buoys (f) and (g) interconnected by plate (h) and contains protective grid. Between buoys are placed movable blades which are maintained perpendicular to flow direction by means of pre-stressed calibrated springs (b) and by which the force acting upon blades is controlled. Blades are fixed to two driving chains (c) and by virtue of shafts cause rotation of two kinetic wheels, gears and alternator.

[0008] DE202006013818U1 discloses a floating conveyer unit with blades driving the electric power generator.

[0009] WO2009103131A2 discloses an electric power plant producing hydroelectric power. The power plant contains a pontoon (**3**) with confusor (**5**) and diffusor (**7**) which are connected through working channel (**6**) where generators (**8**) are mounted within the confusor and diffusor. Along the working channel (**6**) and on the pontoon are placed transmission systems (**4**) which shafts are connected with power generator (**9**). Big (**12**) and small (**13**) sprockets/wheels are connected with transmission system shafts (**16**) of transmission system (**4**), which drive long (**14**) and short (**15**) sprockets/belts where are long (**19**) and short (**20**) parts connected to long (**14**) and short (**15**) sprockets/belts respectively on which are placed groups of blades (**18**) where each individual blade (**21**) is at defined angle relative to working channel (**6**) axis. Pontoon (**3**) is kept at fixed location by means of anchors (**2**).

[0010] No single prior art reference mentioned above solves the technical problem of increasing efficiency, but only disclose general construction characteristics of hydroelectric power plants, and do not disclose solutions based on optimizing the efficiency of individual elements.

SUMMARY OF THE INVENTION

[0011] The present invention relates to the enhancement of efficiency degree of hydrokinetic floating power plant module by defining individual parameters of the driving engine of the hydrokinetic floating power plant.

[0012] By the present invention, an increased efficiency in the use of water flow kinetic energy is provided by improving the hydrokinetic engine working channel and optimizing the gaps z and z' between blades and driving engine working channel planes, the number n referring to number of submerged blades in driving engine working channel, mutual distance between blades, part of the blade height submersed in liquid vs. part of blade height above water surface ratio, as well as the dimensions of the confusor and diffusor. The present invention provides an increase of efficiency in a hydrokinetic floating power plant module.

[0013] The following details and parameters of the improved hydrokinetic driving engine of the present invention provide a significantly improved efficiency in converting the elements contributing to improvement of efficiency in converting water flow kinetic energy into power by improving the hydrokinetic engine working channel:

- **[0014]** 1. determination of optimal gap between blades and internal planes of driving engine channel which is necessary, that with sufficient water and blade velocity in the channel, the wanted water level difference in front and behind blade is achieved and corresponding force on the blade is accomplished.
- **[0015]** 2. determination of optimal relation between blade height submerged in liquid and part of blade height above liquid level with respect to the external liquid level prior to inflow into confusor.
- **[0016]** 3. determination of dimensions and form of confusor and diffusor, and
- **[0017]** 4. determination of distance between blades and number of submerged blades in driving engine channel by which a more constant force of liquid acting on blades is accomplished.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Below is given a short description of drawings and detailed description of invention along with analysis of impact that have a distance between adjacent blades, gap size between blades and internal planes of driving engine channel, dimensions and form of confusor and diffusor and blade velocity.

[0019] Invention will be described in detail with reference to the drawing where:

[0020] FIG. **1** shows a hydrokinetic floating power plant module;

[0021] FIG. **2** shows a driving engine assembly in perspective view with sequence of interconnected blades by endless chain;

[0022] FIG. **3** shows a driving engine assembly in perspective view with sequence of interconnected blades by endless chain;

[0023] FIG. **4** shows a driving engine assembly in perspective view with sequence of interconnected blades by endless chain;

[0024] FIG. **5** shows a side view of driving engine assembly with sequence of interconnected blades by endless chain;

[0025] FIG. **6** shows a schematic presentation of the driving engine in side view;

[0026] FIG. **7** shows a schematic presentation of the driving engine in plan view;

[0027] FIG. **8** shows a s diagram of force change during tested periods for distance between blades being 0.8 m;

[0028] FIG. **9** shows a diagram of force change during tested periods for distance between blades being 3.0;

[0029] FIG. **10** shows a diagram of force change during tested period for distance between blades being 6.0 m;

[0030] FIG. **11** shows a diagram of force change on blades with 10% gap between tunnel and blades in tunnel model with 10 blades being at mutual distance 0.8 m;

[0031] FIG. **12** shows a diagram of force change on blades with 20% gap between tunnel and blades in tunnel model with 10 blades being at mutual distance 0.8 m;

[0032] FIG. **13** shows a diagram of force change on blades with 30% gap between tunnel and blades in tunnel model with 10 blades being at distance 0.8 m;

[0033] FIG. **14** shows a diagram of force change on blades in tunnel model with 10 blades being at distance 0.8 m and with 10% gap between tunnel and blades at inclination of confusor 45° and diffusor 25°;

[0034] FIG. **15** shows a diagram of force change on blades in tunnel model with 10 blades being at distance 0.8 m and 10% gap between tunnel and blades at inclination of confusor 20° and diffusor 20°;

[0035] FIG. **16** shows a diagram of correlation power P(kW) vs. velocity v (m/s) for diffusor and confusor inclination being 45° and 25° respectively.

DETAILED DESCRIPTION OF THE INVENTION

[0036] The details and parameters of the driving engine elements which contribute to an improvement of the hydrokinetic driving engine efficiency and the hydrokinetic floating power plant module efficiency were determined by implementation of commercial CDF (Computational Fluid Dynamics) software. A 2-D flow of a water stream around and within the hydrokinetic floating power plant was simulated in order to examine the influence of geometry and position of the driving engine in the water stream in system efficiency. The k-ϵ model of turbulence and two kinds of flow were studied, particularly:

[0037] non-stationary flow with floating blades and given velocity, and

[0038] stationary flow with imposed given velocity at blade equal to blade velocity.

[0039] In all cases undisturbed water incoming velocity was given and equals to 2 m/s. The following parameters were studied to analyze their impact on efficiency:

[0040] 1) distance t between two adjacent blades being 0.8, 3.0 and 6.0 m;

[0041] 2) gap size z and z' between blades (**6**) and planes (**15**) and (**16**) of the working channel (**14**) in cases when z and z' are 10, 20 and 30%;

[0042] 3) inclination of confusor and diffusor plane angles α, β and γ;

[0043] 4) blade velocity 1, 2 and 3 m/s for undisturbed flow velocity being 2 m/s;

[0044] 5) confusor and diffusor input and output surface ratio respectively, and working channel cross -section surface ratio being 3:1 and 4:1.

[0045] A hydrokinetic floating power plant module is presented in FIG. **1**. Hydrokinetic floating power plant module (**1**) is anchored at a predetermined location by means of four concrete blocks (**3**) which are connected through four buoys (**2**) to a floating power plant platform. The hydrokinetic floating power plant module driving engine (**13**) is located within casing (**4**).

[0046] FIGS. **2** to **4** present perspective view of the hydrokinetic driving engine (**13**) with a sequence of blades (**6**) interconnected by an endless chain (**7**).

[0047] FIG. **5** shows a side view of a driving engine assembly with sequence of blades (**6**) interconnected by endless chain (**7**). In the driving engine (**13**) kinetic energy of water, by the quantity of movement change, is converted into mechanical rotary energy. The working wheel shaft is connected by means of gear assemblies with generator (**9**) where mechanical rotary energy is converted in electrical energy. In the working channel (**14**) of driving engine (**13**) is installed a sequence of blades (**6**), where the blade plane is perpendicular to water flow direction. In order to achieve continuous movement of blades (**6**), they are interconnected by an endless chain (**7**). On the front and back side of driving engine (**13**) are fitted gear assemblies/working wheels which linear movement of blades (**6**) in the channel (**14**) convert into rotary movement, maintain continuous movement of blades (**6**) and direct the blade (**6**) entering into water and coming out perpendicular related to water flow in the working channel (**14**) of driving engine (**13**). Blades (**6**) are attached to endless chain (**7**) and are can be directed to permit vertical entry and exit of blades (**6**) in and out of the water stream to enable entry and exit from the water stream with an even energy input. To achieve a steady water force acting upon blades (**6**) as much as possible, the ratio of non-submerged to submerged parts of blade height in relation to the outside water line before inflow into the confusor should be 10% to 20%. Furthermore, in order to accomplish as much as possible stable water force acting upon blades (**6**), the range of number n simultaneously entirely submerged blades (**6**) in the channel (**14**) of driving engine (**13**) equals 2-6. Gears/working wheels assemblies at front and back side of driving engine (**13**) convert linear movement of blades (**6**) in working channel (**14**) into rotary movement, and kinetic energy taken over by front wheel shaft is converted into mechanical energy carried over to generator rotor (**9**) which generates electrical energy.

[0048] Working channel (**14**) of driving engine (**13**) is formed by two internal side planes (**15**) and bottom plane (**16**). Confusor (**10**) is located at the entry of working channel

(**14**) by which river flow is collected and directed into working channel (**14**) of driving engine (**13**). The dimensions and form of confusor enables collection of targeted quantity of water out from river flow and increase water velocity in the driving engine channel when compared to the water level in the free river flow. For this purpose, the cross section surface of input confusor A_0 is three times bigger than cross-section surface A of the driving engine channel (the ratio of confusor surface with respect to channel surface $A_0/A=3/1$). Confusor (**10**) is bounded by three planes, i.e. by two side planes (**17**) and bottom plane (**18**). FIGS. **6** & **7** show angles α and γ under which confusor planes (**17**) and (**18**) are connected to working channel (**14**). Working channel (**14**) is bounded by three planes set under 90° angle. Side planes (**17**) of confusor (**10**) are set under angle α with respect to the plane of internal side planes (**15**), while confusor bottom plane (**18**) is set under angle γ with respect to bottom plane (**16**) of the working channel (**14**) (see FIGS. **5** & **6**). The inclination angle α of side planes (**17**) and angle γ of confusor (**10**) lower plane (**18**) enable collection of 40% more directed water flow into working channel (**14**) than would otherwise be collected if α=γ=0. The effect of passing this quantity of water through the driving engine working channel (**14**) is to raise the water level in channel (**14**). FIG. **5** indicates rise of water flow (level of internal water) with respect to the water flow level before entering into confusor (**10**) (the level of outside water).

[0049] At the outlet from driving engine working channel (**14**) is located diffusor (**11**) which promotes accelerated water output from channel (**14**) and rapidly equalizes increased height of water column in the channel with height of water in the free flow. By this effect of hydraulic jump is additionally enforced at the last blade (**6**) in the channel (**14**), which from the linear movement goes into circular movement, and goes out perpendicularly to water flow direction in the channel. Diffusor (**11**) is also bounded by three planes, i.e. by two side planes (**19**) and bottom plane (**20**). Side plane (**19**) of diffusor (**11**) is set under angle β with respect to the plane of internal side planes (**15**) of the working channel (**14**). FIG. **6** & **7** illustrate schematic presentation of the driving engine in side view and top view showing values l, h, t, z and z' where l means width of the working channel (**14**), h the height of water level in the working channel (**14**), t is distance between adjacent blades (**6**), z and z' is gap between internal planes (**15**) & (**16**) of the working channel (**14**) and end edges of blades (**6**). The gap z is expressed in %, and is defined as ratio between channel width l and the part being between end edges of the blades (**6**) and planes (**15**) of the working channel (**14**). The gap z' is expressed in %, and is defined as ratio between the height of water level h and the part being between end edge of the blades (**6**) and bottom plane (**16**) of the working channel (**14**).

[0050] The impact of confusor and diffusor inclination has been examined in a working channel model with 10 blades having distance between them 0.8 m and gaps z and z' 10%.

[0051] The following cases have been tested:

[0052] confusor angle 2α=45°, diffusor angle 2β32 25°-200 cycles

[0053] confusor angle 2α=20° diffusor angle 2β=20°-200 cycles

[0054] From analysis of diagrams presented in FIG. **14** and **15** can be seen that with smaller confusor and diffusor angle (20°), see FIG. **15**, a greater force is accomplished than it would be the case with bigger confusor and diffusor angles (45° and 25°), see. FIG. **14**. Increased efficiency degree of the driving engine (**13**) is achieved:

[0055] for confusor side planes (**17**) inclination with respect to the plane of working channel side planes (**15**), angle α in range from 20° to 30°,

[0056] for confusor bottom plane (**18**) inclination with respect to the working channel bottom plane (**16**), angle γ in range from 10° to 30°, and

[0057] for diffusor side planes (**19**) inclination with respect to the plane of working channel side planes (**15**), angle β in range from 10° to 20°.

[0058] Apart from influence of plane inclinations α, γ and β of confusor (**10**) and diffusor (**11**) on the efficiency of driving engine (**13**), the influence of ratio confusor inlet cross section A**0** and diffusor outlet cross section B**0** and cross section A of the working channel (**14**) has been analyzed. A variant with confusor and diffusor having four times larger cross section A**0** and B**0** respectively than cross section A of the working channel (**14**) for various blade velocities has been examined. These results are given in the table below where γ denotes distance from adjacent module, v_{lop} is blade velocity and v_{in} is velocity of water flow.

Y [m]	v_{in} [m/s]	v_{lop} [m/s]	B0/A or A0/A [—]	Q [m3/s]	F [N]	P [W]	F/m^2 [N]	P/m^2 [kW]
27.04	1	2	3x	0.75	510.56	1021.13	340.38	0.68
5.5	**2**	**2.66**	**4x**	**2.00**	**13419.89**	**35696.90**	**8946.59**	**23.80**
5.5	2	1.33	4x	1.00	24856.19	33058.74	16570.79	22.04

[0059] The greatest power has been obtained in the case of 5.5 m distance from the adjacent block, with confusor inlet cross section A**0** and diffusor outlet cross section B**0** increase four times with respect to the working channel (**14**) cross section A, at blade velocity v_{lop}=2.66 m/s and water velocity v_{in}=2 m/s. This case is presented in the table in bold. The ratio of confusor input cross section A**0** and working channel cross section A-A**0**/A, and ratio of diffusor outlet cross section B**0** and working channel cross section A-B**0**/A , are within range 2 to 4.

[0060] FIGS. **6** & **7** illustrate schematic presentation of driving engine in side view with values l, h, t, z, and z' where l is width of working channel (**14**), h is height of water level in working channel (**14**), t is distance between adjacent blades (**6**) and z and z' are gaps between internal planes (**15**) and (**16**) of working channel (**14**) and end edges of blades (**6**). Increased water velocity and level in working channel, gaps z and z' between planes (**15**) and (**16**) of working channel (**14**) and end edges of blades (**6**) as well as decreased blade velocity in time of overtake of water kinetic energy result in water column height difference before and after the blade by which the effect of hydraulic jump occurs resulting with increase of force upon the blade, i.e. increase in take over power at blade. In the example of a tunnel with 10 blades, with distance between them being 0.8 m, the influence of gap size z and z' to the accomplished forces on all blades (**6**) have been examined. FIGS. **11**, **12** and **13** present diagrams of force changes on the blades with gaps z and z' between working channel (**14**) and end edges of blades (**6**) being 10%, 20% and 30%. The following cases have been examined:

[0061] gap z and z' 10%-200 cycles

[0062] gap z and z' 20%-400 cycles

[0063] gap z and z' 30%-400 cycles

[0064] From diagrams in FIGS. **11**, **12** and **13** one can see that greater forces have been realized with lower gap values z and z'. The greatest force has been realized in case of 10% gap between tunnel and end edges of blade (**6**). Accordingly, the gaps z and z' by which have been realized greater forces are in the range from 2% to 10% of the blade (**6**) surface.

[0065] Further on, the influence of distance t between two adjacent blades has been analyzed. It was analyzed the working channel (**14**) with one blade traveling down the stream at given velocity and after certain time the blade suddenly raised while at the beginning of tunnel in the same time occurred another blade. The following cases have been examined:

[0066] distance t between blades 0.8 m-600 cycles

[0067] distance t between blades 3.0 m-200 cycles

[0068] distance t between blades 6.0 m-200 cycles

[0069] Diagrams on FIGS. **8**, **9** and **10** present change of force during testing cycles, where one cycle is travel time for one blade from its occurrence at the tunnel inlet until it's rising, for distance between blades 0.8 m, 3.0 m and 6.0 m.

[0070] It was needed 200 to 600 cycles to stabilize periodic flow.

[0071] From diagrams in FIGS. **8**, **9** and **10** can be seen how distance between blades affects the force magnitude. With the distance being 8.8 m the realized force is between 40 and 50 kN, and it is unstable. Unlike to previous case, with distance being 3 to 6 m the realized force was about 58 kN and was stable within the whole range. Though, with distance between blades being 6 m the realized force was a little bit bigger, however from commercial stand point such dimensions are not acceptable. Increased efficiency degree of the driving engine (**13**) is accomplished for distance t between blades in range from 0.5-3.0 m.

[0072] By analysis of the influence of blade velocity in example with stationary flow, the exchanged energy between tunnel inlet and outlet cross sections has been calculated. The water velocity at the inlet in domain was 2 m/s, and confusor (**10**) and diffusor (**11**) angles were $2\alpha=45°$ and $2\beta=25°$. FIG. **16** indicates diagram of power P (kW) dependence on velocity v (m/s) for diffusor (**11**) angles: $2\alpha=45°$ and $2\beta=25°$. Examined were cases for:

[0073] blade velocity 1 m/s

[0074] blade velocity 2 m/s

[0075] blade velocity 3 m/s

[0076] Analysis of power exchanged shows that the greatest power is achieved with blade velocity being 2 m/s, which corresponds to optimal velocity of 33% of undisturbed velocity through tunnel (without blades), and which would be 6 m/s with three times larger tunnel cross section, and which provides power optimization at the given stream velocity.

[0077] Finally, for solution of technical problem how to increase water flow kinetic energy efficiency degree in the working channel (**14**) of driving engine assembly (**13**), and by this to increase efficiency of the whole hydrokinetic floating power plant (**1**), ranges of parameters of individual elements are the following:

gap between blades and working channel z i z'	2-10%
distance between blades t	0.5-3.0 m
confusor angle α	20°-30°
diffusor angle β	10°-20°
reduction of confusor A0/A	2-4
widening of diffusor B_o/A	2-4
number of blades in working channel n	2-6
confusor angle with respect to horizontal line γ	10°-30°

[0078] A hydrokinetic floating power plant (**1**) can be used together with driving engine assembly (**13**) as integrated floating module which can be individually or aggregately installed by anchoring in free river streams and derivative canals. In this way electric power is generated for end user by ecological acceptable source which contributes to generation of electric power from renewable sources. By this, so generated electric power contributes to general energetic efficiency and reduction of greenhouse gases. This type of floating module enables flora and fauna migration from river habitation, and because all assemblies are of mechanical type, there is no environment pollution.

What is claimed is:

1. A hydrokinetic driving engine, comprising:

a working channel defined by bounded by two sidewalls and an floor and having cross sectional area A;

two parallel endless chains holding a plurality of blades, said blades being moved into and out of the working channel with the blades located in the working channel maintained perpendicular to a direction of water flow in the working channel;

the blades having side edges and a bottom edge;

the blade side edges and the working channel internal sidewalls being separated by a gap z;

the blade bottom edge and the working channel internal floor being separated by a gap z';

the blades being separated from each other by a distance t;

a confusor having inlet side planes and an inlet bottom plane located at an inlet of the working channel, and having an inlet cross section surface A**0**;

a diffusor having outlet side surfaces located at an outlet of working channel having an outlet cross section surface B**0**

gear assemblies which convert linear movement of the plurality of blades in the working channel to rotary movement of a gear shaft;

an electrical generator operably connected to the gear shaft, wherein:

a ratio of an un-submerged part of blade height to a submerged part of blade height with respect to an outside water line prior to water inflow into the confusor is 10 to 25%;

an inclination angle α of confusor side planes relative to the working channel sidewalls is 20° to 30°;

an inclination angle γ of a confusor bottom plane with respect to working channel floor is 10° to 30°;

an inclination angle β of diffusor outlet side surfaces relative to the working channel sidewalls is 10° to 20°,

gaps z and z' are 2-10% of a blade surface,

a number n of simultaneously entirely submerged blades in the working channel is 2-6, and

distance t between adjacent blades is 0.5-3.0 m.

2. A hydrokinetic driving engine according to claim **1**, wherein a ratio A**0**/A of confusor inlet cross section A**0** and working channel cross section A is 2 to 4.

3. A hydrokinetic driving engine according to claim **2**, wherein the ratio A**0**/A of confusor (**10**) inlet cross section surface A**0** and working channel cross section A is 4.

4. A hydrokinetic driving engine according to claim **1**, wherein a ratio of diffusor outlet cross section surface B**0** and working channel cross section A is 2 to 4.

5. A hydrokinetic driving engine according to claim **4**, wherein the ratio of diffusor outlet cross section surface B**0** and working channel cross section A is 4.

6. A hydrokinetic driving engine according to claim **1**, wherein the size of gaps z and z' is 10% of the blade surface.

7. A hydrokinetic driving engine according to claim **1**, wherein the distance t between adjacent blades is 3.0 m.

8. A hydrokinetic floating power plant module, comprising:

a floating power plant platform connected to four anchor blocks and four buoys;

a hydrokinetic driving engine, including:

a working channel defined by bounded by two sidewalls and an floor and having cross sectional area A;

two parallel endless chains holding a plurality of blades, said blades being moved into and out of the working channel with the blades located in the working channel maintained perpendicular to a direction of water flow in the working channel;

the blades having side edges and a bottom edge;

the blade side edges and the working channel internal sidewalls being separated by a gap z;

the blade bottom edge and the working channel internal floor being separated by a gap z';

the blades being separated from each other by a distance t;

a confusor having inlet side planes and an inlet bottom plane located at an inlet of the working channel, and having an inlet cross section surface A**0**;

a diffusor having outlet side surfaces located at an outlet of working channel having an outlet cross section surface B**0**

gear assemblies which convert linear movement of the plurality of blades in the working channel to rotary movement of a gear shaft;

an electrical generator operably connected to the gear shaft, wherein:

a ratio of an un-submerged part of blade height to a submerged part of blade height with respect to an outside water line prior to water inflow into the confusor is 10 to 25%;

an inclination angle α of confusor side planes relative to the working channel sidewalls is 20° to 30°;

an inclination angle γ of a confusor bottom plane with respect to working channel floor is 10° to 30°

an inclination angle β of diffusor outlet side surfaces relative to the working channel sidewalls is 10° to 20°,

gaps z and z' are 2-10% of a blade surface,

a number n of simultaneously entirely submerged blades in the working channel is 2-6, and

distance t between adjacent blades is 0.5-3.0 m; and

a casing enclosing the hydrokinetic driving engine.

9. A hydrokinetic floating power plant module according to claim **8**, wherein a ratio A**0**/A of confusor inlet cross section A**0** and working channel cross section A is 2 to 4.

10. A hydrokinetic floating power plant module according to claim **9**, wherein the ratio A**0**/A of confusor (**10**) inlet cross section surface A**0** and working channel cross section A is 4.

11. A hydrokinetic floating power plant module according to claim **8**, wherein a ratio of diffusor outlet cross section surface B**0** and working channel cross section A is 2 to 4.

12. A hydrokinetic floating power plant module according to claim **11**, wherein the ratio of diffusor outlet cross section surface B**0** and working channel cross section A is 4.

13. A hydrokinetic floating power plant module according to claim **8**, wherein the size of gaps z and z' is 10% of the blade surface.

14. A hydrokinetic floating power plant module according to claim **8**, wherein the distance t between adjacent blades is 3.0 m.

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