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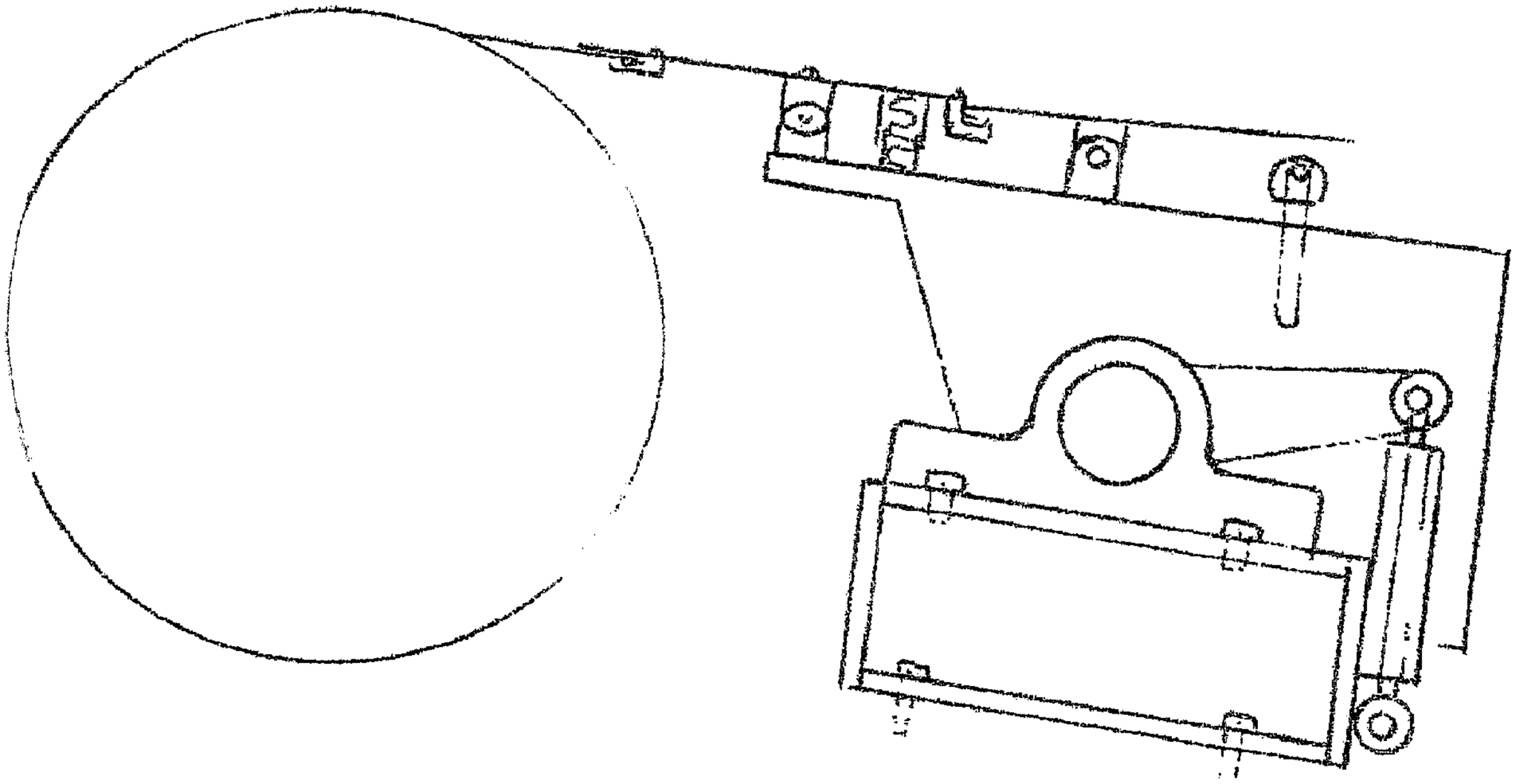
(54) Title: BLADE HOLDING DEVICE, APPARATUS INCLUDING THE SAME, AND METHOD OF OPERATING ASSOCIATED THERETO



BLADE HOLDING DEVICE, APPARATUS INCLUDING THE SAME, AND METHOD OF OPERATING ASSOCIATED THERETO

Field of the invention:

The present invention relates to a blade holding device, hereinafter also referred to as a "No Maintenance Flex System", or simply "N. M. Flex System". More particularly, the present invention relates to a blade holding device such as the ones employed to cooperate with rollers of machines used in the pulp and paper industry, and other like industries. The present invention also relates to an apparatus, such as a machine for example, provided with the device, and to a method of operating associated thereto.

Background of the invention:

It is known in the art that a paper machine such as the ones used in the pulp and paper industry, generally comprises an important quantity of rollers that have different utilities. Typically, the rollers must be cleaned by means of scrapers. Each scraper is generally provided with a blade-holder which contains an interchangeable blade, and each blade-holder must generally carry out a constant pressure on the blade so as to be able to properly clean the surface of the roller.

These types of blade-holders have been used in the industry of pulp and paper for many years now. Known in the art are two main types of blade-holders, namely: a) flexible blade-holders whose loading system operates by means of a hose filled with air, glycol, silicon, or the like, and b) rigid blade-holders which are not provided with a direct loading system. Their main function is to retain a blade designed to that effect and enable the latter to clean the roller while keeping a constant pressure when the roller turns. In order to carry out the cleaning, the blade must be in compression (loaded) on the roller, and it is for this reason that the compression (loading) system is essential.

Also known in the art are DST and KF blade-holders, and the various problems associated thereto, namely the fact that they require a hose for operation thereof, the hose drying up after a certain service time, which requires substantial maintenance, and thus in turn prevents production of paper, as well as the fact that these blade-holders generally require the assistance of a control box for proper operation thereof, and thus complicated electronics and corresponding maintenance and servicing thereof is required, and the like, which is very disadvantageous for various reasons.

Hence, in light of the aforementioned, there is a need for a improved blade holding device which, by virtue of its design and components, would be able to overcome some of the aforementioned prior art problems.

Summary of the invention:

The object of the present invention is to provide a device which satisfies some of the above-mentioned needs and which is thus an improvement over other related blade holding devices and methods known in the prior art.

In accordance with the present invention, the above object is achieved, as will be easily understood, with a blade holding device such as the one briefly described herein and such as the one exemplified in the accompanying drawings.

According to another aspect of the invention, there is also provided an apparatus provided with the above-mentioned blade holding device.

According to yet another aspect of the invention, there is also provided a method of operating the above-mentioned blade holding device and/or apparatus.

According to yet another aspect of the invention, there is also provided a kit with components for assembling the above-mentioned blade holding device and/or apparatus.

The objects, advantages and other features of the present invention will become more apparent upon reading of the following non-restrictive description of preferred embodiments thereof, given for the purpose of exemplification only with reference to the accompanying drawings.

Brief description of the drawings:

Figure 1 is a schematic side view of an apparatus provided with a blade holding device according to a preferred embodiment of the present invention, the apparatus being shown cooperating with a roller.

Figure 2a is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention, the device being shown provided with a blade.

Figure 2b is a schematic top view of a portion of what is shown in Figure 2a.

Figure 2c is a perspective view of some components of the device shown in Figure 2a.

Figure 2d is a sectional view of a component of the device shown in Figure 2a.

Figure 2e is a side elevational plan view of what is shown in Figure 2d.

Figure 2f is an elevational view of the spring shown in Figure 2d, the spring being shown now in an uncompressed configuration.

Figure 3 is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention.

Figure 4a is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention.

Figure 4b is a sectional view of a component of the device shown in Figure 4a.

Figure 4c is a partial perspective view of what is shown in Figure 4b.

Figure 4d is an elevational view of the spring shown in Figure 4b, the spring being shown now in an uncompressed configuration.

Figure 4e is a schematic top view of a portion of what is shown in Figure 4a.

Figure 5 is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention, the apparatus being shown cooperating with a roller.

Figure 6 is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention.

Figure 7 is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention, the apparatus being shown cooperating with a roller.

Figure 8a is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention, the apparatus being shown cooperating with a roller.

Figure 8b is a schematic enlarged view of a component of the device shown in Figure 8a.

Figure 9a is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention, the apparatus being shown cooperating with a roller.

Figure 9b is a schematic top view of a portion of what is shown in Figure 9a.

Figure 10a is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention, the apparatus being shown cooperating with a roller, and the blade holding device being shown in an operating configuration.

Figure 10b is another schematic side view of what is shown in Figure 10a, the blade holding device being shown now in a retracted configuration.

Figure 11a is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present invention, the apparatus being shown cooperating with a roller, and the blade holding device being shown in an operating configuration.

Figure 11b is another schematic side view of what is shown in Figure 11a, the blade holding device being shown now in a retracted configuration.

Figure 12a is a schematic side view of an apparatus provided with a blade holding device according to another preferred embodiment of the present

invention, the apparatus being shown cooperating with a roller, and the blade holding device being shown mounted with a blade in a retracted configuration.

Figure 12b is another schematic side view of what is shown in Figure 12a, the blade holding device and corresponding blade being shown now in an operating configuration.

Figure 12c is another schematic side view of what is shown in Figure 12b, the blade holding device and corresponding blade being shown now in an operating configuration after the blade has been substantially used up.

Figure 13a is a schematic perspective view of a spring which may be used with the blade holding device according a preferred embodiment of the present invention.

Figure 13b is a side elevational view of what is shown in Figure 13a.

Figure 14a is a schematic perspective view of a spring which may be used with the blade holding device according a preferred embodiment of the present invention.

Figure 14b is a side elevational view of what is shown in Figure 14a.

Figure 15a is a schematic perspective view of a spring which may be used with the blade holding device according a preferred embodiment of the present invention.

Figure 15b is a side elevational view of what is shown in Figure 15a.

Detailed description of preferred embodiments of the invention:

In the following description, the same numerical references refer to similar elements. The embodiments and quantities shown in the figures are preferred.

Moreover, although the present invention was primarily designed for use with machines and rollers of the pulp and paper industry, it may be used with other type of objects and in other different fields, as apparent to a person skilled in the art. For this reason, expressions such as "roller", "pulp", "paper", etc. used herein should not be taken as to limit the scope of the present invention and includes all other kinds of items and/or applications with which the present invention could be used and may be useful.

Moreover, in the context of the present invention, the expressions "device", "system", "holder", and any other equivalent expression and/or compound word thereof known in the art will be used interchangeably. Furthermore, the same applies for any other mutually equivalent expressions, such as "apparatus" and "machine", as well as "spring" and "biasing means" for example, as also apparent to a person skilled in the art.

In addition, although the preferred embodiment of the present invention as illustrated in the accompanying drawings comprises various components and although the preferred embodiment of the blade holding device as shown consists of certain geometrical configurations as explained and illustrated herein, not all of these components and geometries are essential to the invention and thus should not be taken in their restrictive sense, i.e. should not be taken as to limit the scope of the present invention. It is to be understood, as also apparent to a person skilled in the art, that other suitable components and cooperations thereinbetween, as well as other suitable geometrical configurations may be used for the blade holding device and corresponding components according to the present invention, as briefly explained and inferred herein, without departing from the scope of the invention.

Broadly described, the present invention as shown in the accompanying drawings relates to a blade holding device such as the ones employed to cooperate (e.g. scrape, maintain, guide, etc.) with rollers of machines used in the pulp and paper industry, and other like industries.

The present invention concerns a blade-holder of flexible-type designed to be used in an environment at high temperatures, as well as in very humid conditions. As will be understood from the following explanation, it can replace the blade-holders of type DST and KF at any given position.

As will be briefly explained hereafter, the N.M. Flex system is completely closed to prevent that it be obstructed by the paste fibers and dust. The opening for the changing of a blade is activated by a cam-retractor system complementary to the N.M. Flex. It is also possible to activate the opening by means of a pressure-rig lever arm or even by means of pneumatic actuators.

As shown in the accompanying drawings, the loading system is designed by means of biasing means, such as compression springs for example, which are disposed in a manner so as to create a constant force on the blade-holder, which enables the blade to be in contact with the roller in a constant manner and this without maintenance for years of intense service, whereas the loading of the DST for example is carried out by means of hoses such as those used for fires, or rubberized, which dry up and deteriorate after some time. This determining factor is a very important point to be considered since the great losses of time related to maintenance increase the costs of production of paper considerably.

As will be explained and illustrated, the N.M. Flex loading system does not require any control panel contrary to that of the DST which adds even more maintenance, and is by far superior to the blade-holders of type KF and KB which are rigid and do not offer any flexibility, thus cannot match in a uniform manner the surface of the rollers.

The N.M. Flex system as well as the different embodiments thereof can be secured to the frame of the scraper or can be mounted onto tracks, in this manner they can be replaced easily by removing them via the extremities of the scraper.

According to the present invention, the loading system is carried out by means of biasing means, such as springs, irrespectively of the disposition, the shape, the nature, the dimensions or the material used for the manufacturing thereof, and thus any variations from the present invention, as can be easily understood from the following embodiments by a person skilled in the art, is considered to be within the scope of the present invention.

The blade holding device according to the present invention, also referred to as "N.M. Flex loading system", preferably comprises the following components, as shown in Figure 1: a base for the body, a compression spring , a holding base for the spring, and a cover for the body, but preferably comprises the following components depending on the particular embodiment of the invention.

List of numerical references and corresponding components illustrated:
(components 1 to 8 are essentially the same in most figures)

In Figures 2a-2f, for embodiment of the blade holding device entitled "N.M. Flex":

1. assembled loading system
2. track
3. pivot rod
4. clevis for pivot
5. plate of blade-holder
6. finger for holding the blade
7. interchangeable blade
8. scraper

9. upper portion of the loading system
10. lower portion of the loading system
11. compression spring
12. maintenance rod (maintains the system in one single piece)
13. holding button of the springs

In Figure 3, for embodiment of the blade holding device entitled “Multi-Flex”:

1. loading system of type Flex
2. manual shaft adapted for receiving several loading systems of different forces according to particular needs.

In Figures 4a-4e, for embodiment of the blade holding device entitled “Flex Plus”:

1. assembled Flex Plus system
2. upper portion of the loading system
3. lower portion of the loading system
4. compression spring

In Figure 5, for embodiment of the blade holding device entitled “Vertical N.M. Flex”:

1. N.M. Flex or Flex Plus loading system
2. push button block
3. opening block

In Figure 6, for embodiment of the blade holding device entitled “basic Flex”:

1. compression spring
2. holding button of springs

In Figure 7, for embodiment of the blade holding device entitled “Flex track”:

1. loading system with traction spring

In Figures 8a-8b, for embodiment of the blade holding device entitled “hinge system”:

1. hinge
2. traction spring

In Figures 9a-9b, for embodiment of the blade holding device entitled “basic system”:

1. traction spring
2. holding base for spring

In Figures 10a-10b, for embodiment entitled “cam-retractor”:

1. cam-retractor in neutral position
2. cam-retractor in operation

In Figures 11a-11b, for embodiment entitled “opening by hinge”:

1. N.M. Flex system
2. hinge
3. piece for opening
4. N.M. Flex system in opened position

Referring now to Figures 2a-2f, there is shown a first preferred embodiment of the blade holding device according to the present invention. Preferably, as illustrated, the loading system for the N.M. Flex blade-holder consists of a housing made into two pieces which nest one into the other. In this housing, there is the spring base and the springs. The number of springs as well

as the dimension thereof are determined by the force which is required. The housing is preferably provided with oblong holes in which there is the holding pins which prevent the housing from being separated but which do not impede the latter from operating from top to bottom, that is, from expanding. The length of the loading system is determined by the length of the blade-holder, namely: preferably more or less equal to.

Referring now to Figure 3, there is shown another preferred embodiment of the blade holding device according to the present invention, referred to herein also as "N.M. Multi-Flex system". Preferably, as illustrated, the N.M. Multi-Flex system is composed of various N.M. Flex systems inserted about a rotating shaft. The N.M. Multi-Flex system can be constructed by means of any system provided with any type of spring. For obtaining the desired pressure on the blade, simply turn the shaft until the desired position.

Referring now to Figures 4a-4e, there is shown another preferred embodiment of the blade holding device according to the present invention, referred to herein also as "N.M. Flex Plus system". Preferably, as illustrated, the N.M. Flex Plus system resembles a lot the N.M. Flex system and what makes it different is the fact that each spring is mounted onto a closed system in an independent manner, thereby the load is concentrated onto each spring, which increases the flexibility of the blade-holder. This system is mounted onto a retractable track.

Referring now to Figure 5, there is shown another preferred embodiment of the blade holding device according to the present invention, referred to herein also as "Vertical N.M. Flex system". Preferably, as illustrated, the system exerts a vertical pressure, it is provided with a push button of triangular shape. When the push button raises the block (3) located at the end of the blade-holder, this has as an effect to create a pressure on the blade.

Referring now to Figure 6, there is shown another preferred embodiment of the blade holding device according to the present invention, referred to herein also as "Basic Flex system". Preferably, as illustrated the basic flex system is relatively simple because it uses springs without the body or the envelope used with the N.M. Flex, and can be also mounted onto tracks and it is disposed in the same manner as the N.M. Flex Plus system.

Referring now to Figure 7, there is shown another preferred embodiment of the blade holding device according to the present invention, referred to herein also as "Track Flex system". Preferably, as illustrated, the Track Flex system is devised according to a principle similar to the N.M. Flex system, that is, inside of the closed housing, except that it is designed by means of traction springs and that it is located in front of the blade-holder.

Referring now to Figures 8a-8b, there is shown another preferred embodiment of the blade holding device according to the present invention, referred to herein also as "Hinge system". Preferably, as illustrated, this system operates by means of traction springs installed onto a hinge spring carrier. When the spring retracts itself, it forces the blade-holder to rise, which has as a goal to create a pressure on the blade.

Referring now to Figures 9a-9b, there is shown another preferred embodiment of the blade holding device according to the present invention, referred to herein also as "Basic traction system". Preferably, as illustrated, the system is provided with traction springs secured to the blade-holder, as shown in Figure 10.

Referring now to Figures 10a-10b, there is shown another preferred embodiment of the present invention, referred to as "cam-retractor", which is a complement to the N.M. Flex loading system. Preferably, as illustrated, the opening system of the N.M. Flex is composed of a series of cams (number varying according to the appropriate length). This system known as cam-retractor

serves to disengage the N.M. Flex system during the changing of the blade, as shown in Figure 10b.

Referring now to Figures 11a-11b, there is shown another preferred embodiment of the present invention, referred as "opening system by fixed hinge under the flex loading system". Preferably, as illustrated, the operation of this system is as following: the base is in fact a hinge on which is fixed an N.M. Flex loading system; the hinge is activated manually by a lever. When the lever is displaced, it opens the hinge and displaces the loading system and the latter activates the opening as shown in the diagram.

In regards to the setting of the operation pressures according to a preferred embodiment of the present invention: for obtaining the equivalent pressure to that of the PSI required, pressure tests are preferably carried out by means of a closed hose at the end linked to a manometer in which compressed air is sent and then one adjusts the desired pressure. When the blade-holder is parallel, the pressure is equivalent to the PSI indicated in the manometer. Thus, for example: by knowing that three springs of 2" long with a spiral of 5/8" and a diameter of 0.080" mounted inside of the compression system body on a distance of 18" is equivalent to 10 PSI.

As may now be appreciated, the present invention is a substantial improvement over the prior art in that by virtue of its design and components, the blade holding device according to the present invention a) has a loading system requiring substantially no maintenance and is thus a revolutionary concept since the arrival on the market of the DST blade-holders; similarly to the DST, it can be mounted on a plate of about 0.060 inches but different thicknesses, shapes and configurations may be used; b) the N.M. Flex is a revolutionary loading system operating by means of a closed system without maintenance nor control panel and comprising a flexibility equal and/or superior to that what is best done presently in the market; c) the N.M. Flex loading system is without maintenance because it does not dry up, and offers also a constant pressure and does not

require any control box; d) the N.M. Flex loading system is designed for working in an environment at high temperature as well as in a very humid environment; e) the system can be provided on conversion sets for replacing DST and KF systems; and f) the N.M. Flex system can be used on new equipment as well as current equipment. Moreover, the present invention is also advantageous in that it may be operated manually or automatically, directly or remotely.

Of course, numerous modifications could be made to the above-described embodiments without departing from the scope of the invention as apparent to a person skilled in the art.

Figure 1

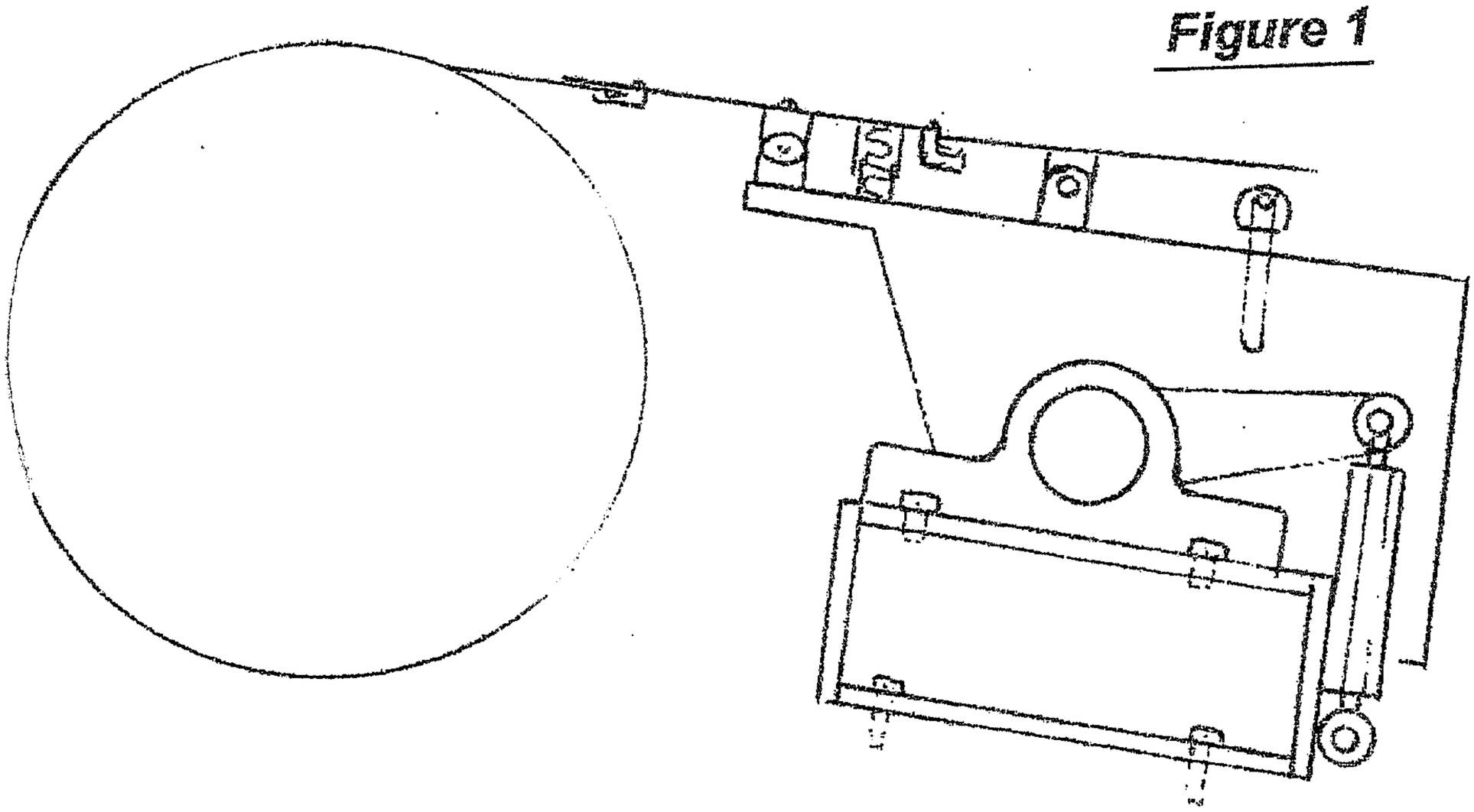
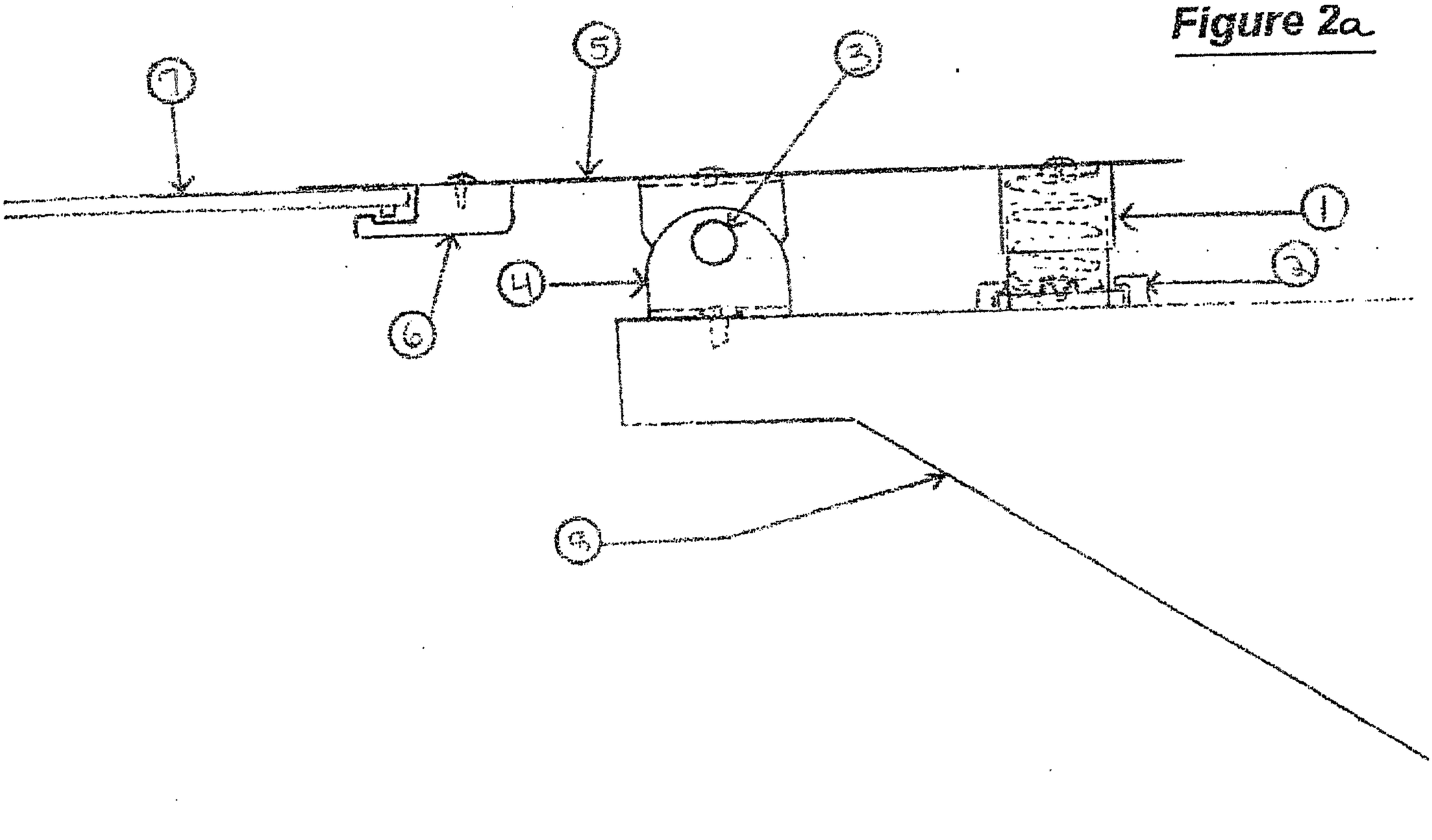


Figure 2a



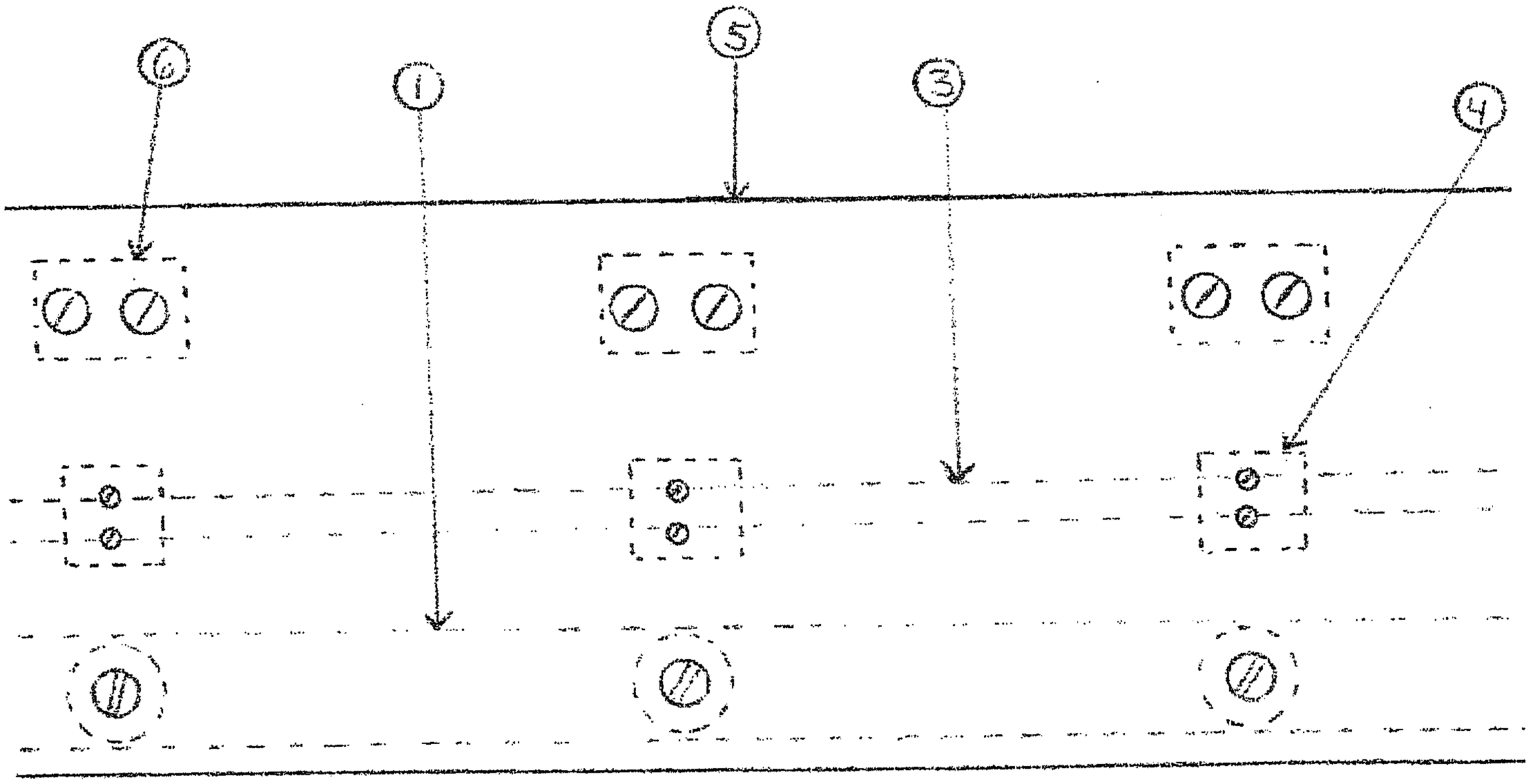


FIGURE 2b

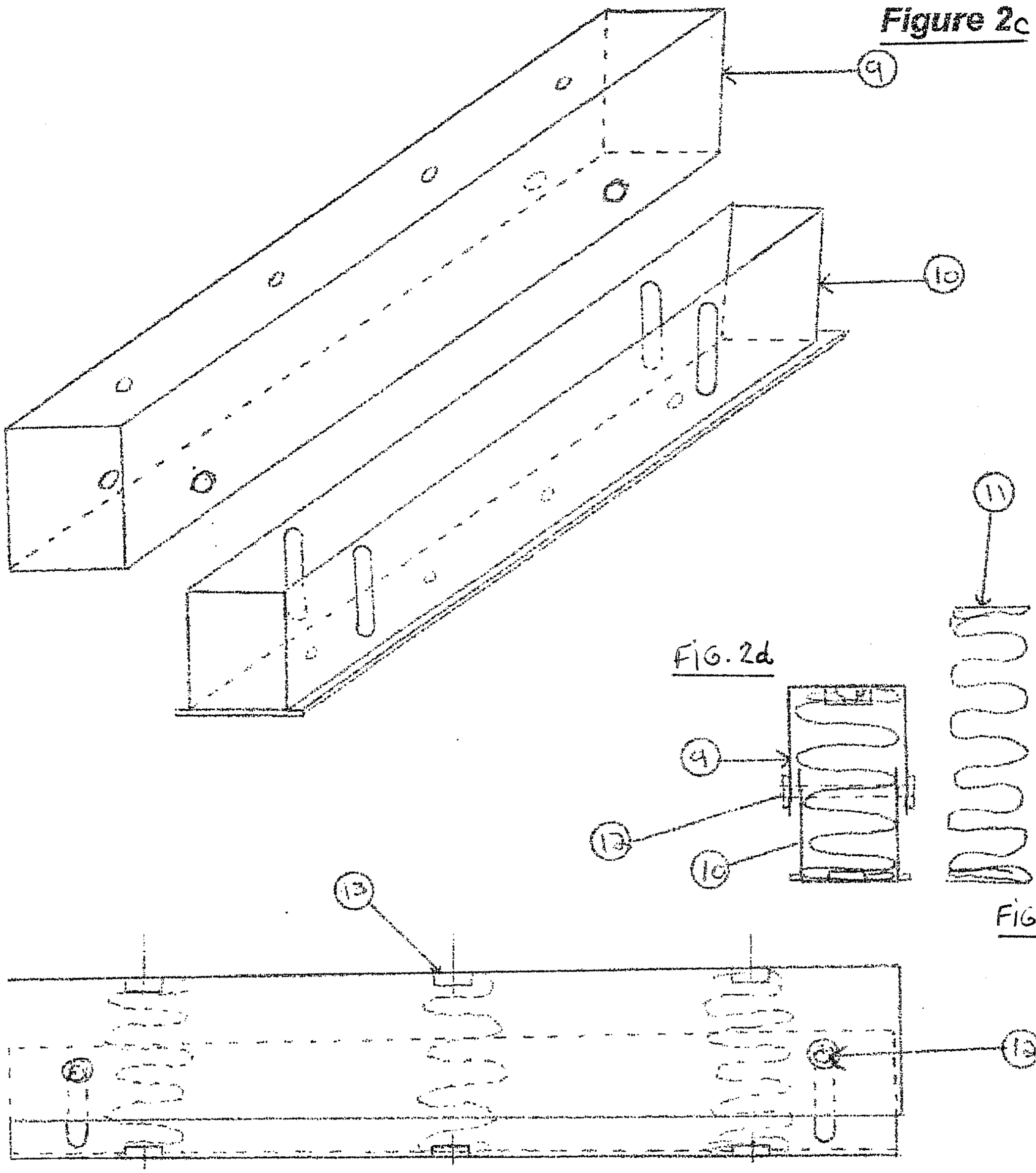


Figure 2c

FIG. 2d

FIG. 2f

FIG. 2e

Figure 3

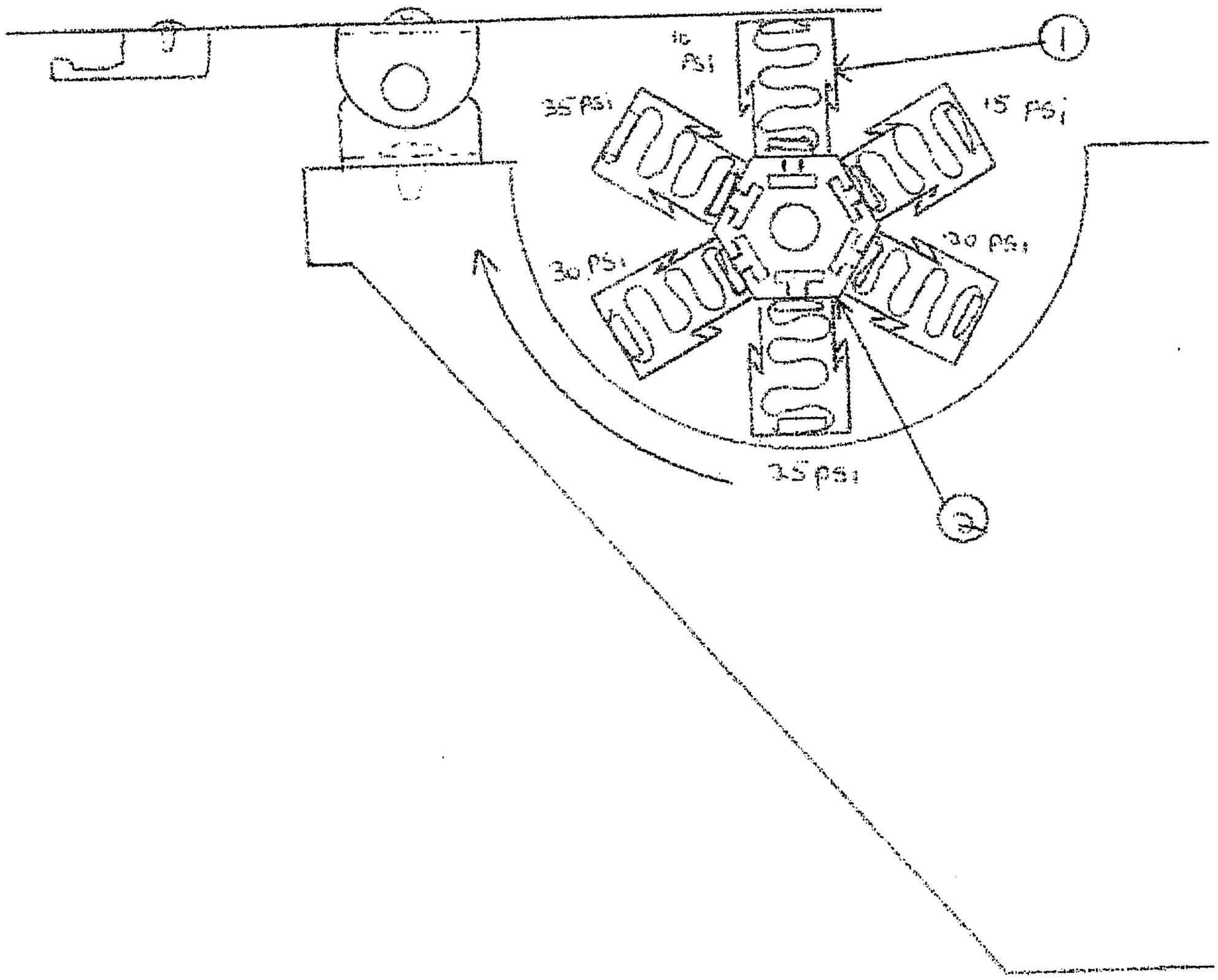


Figure 4a

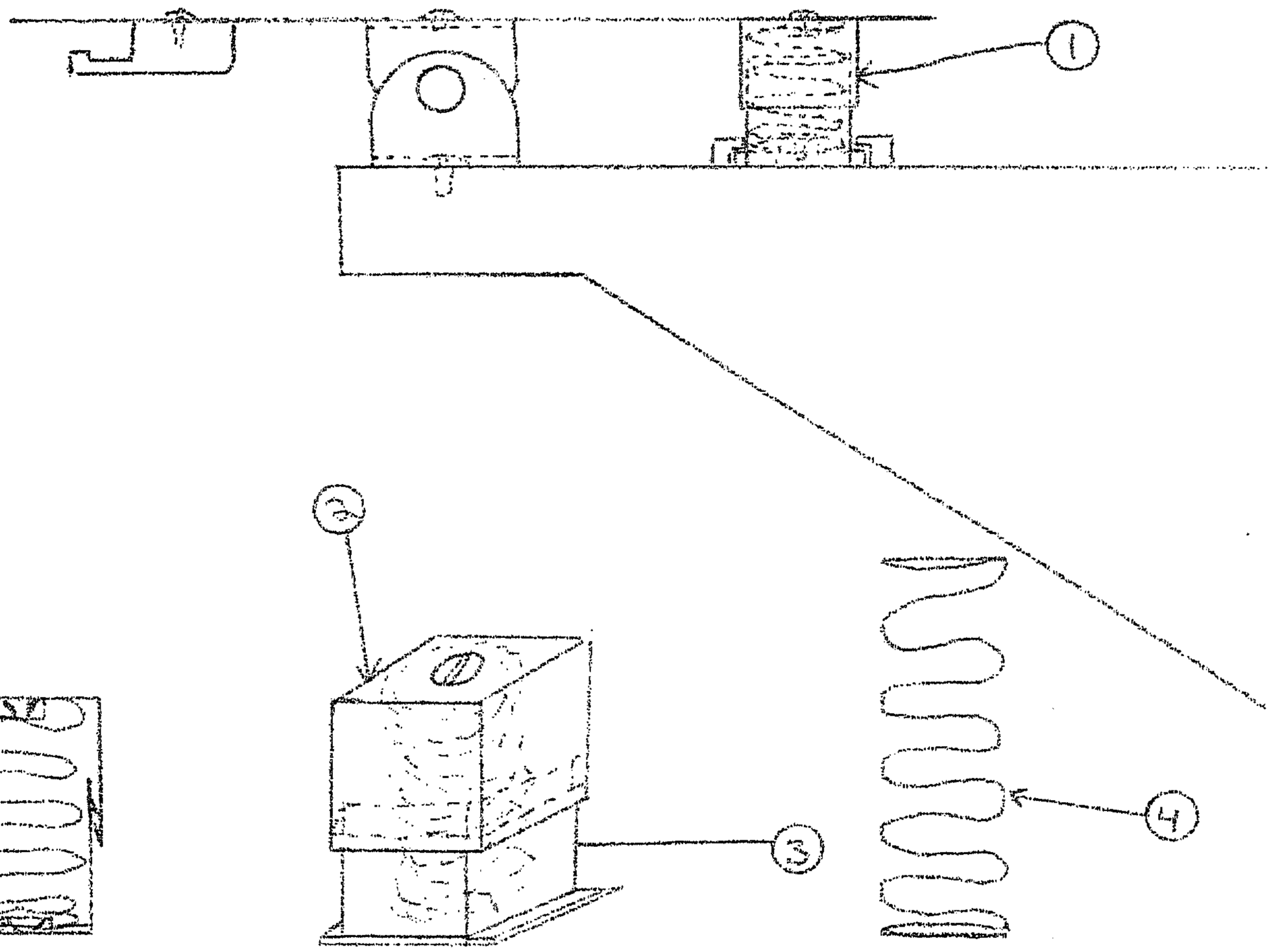


Fig. 4b

Fig. 4c

Fig. 4d

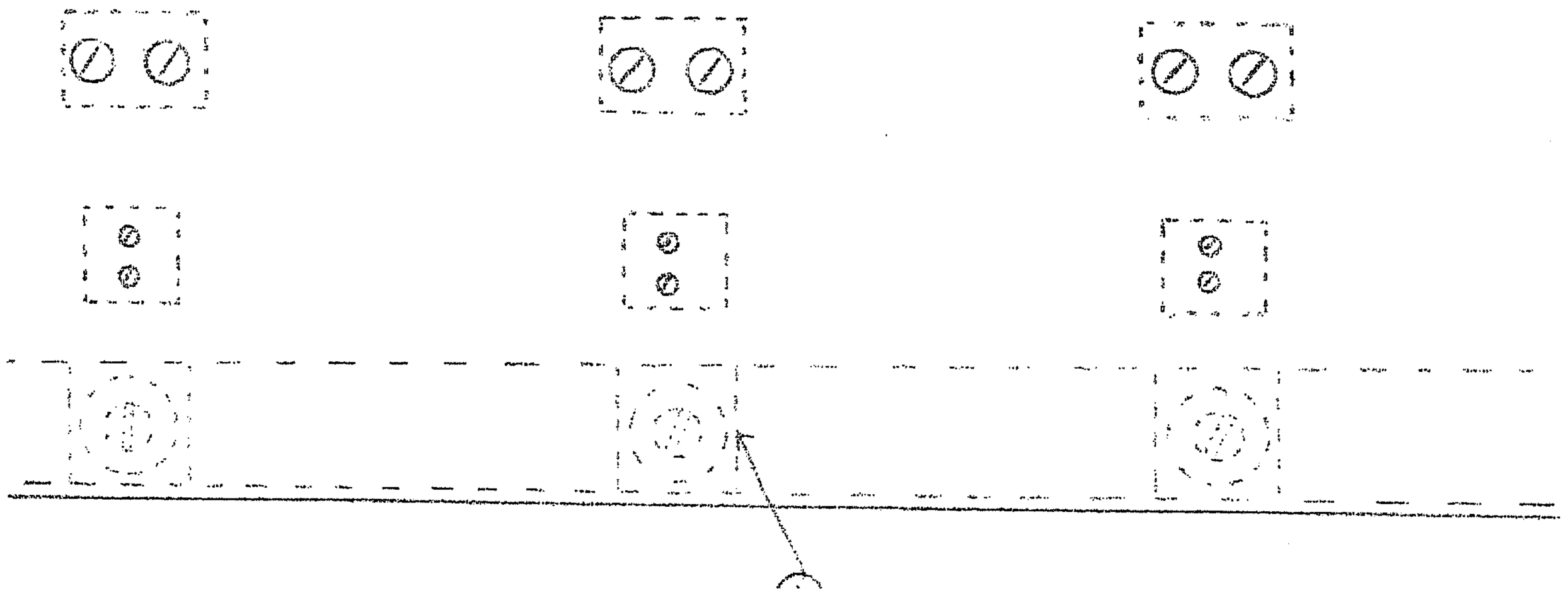


Fig. 4e

Figure 5

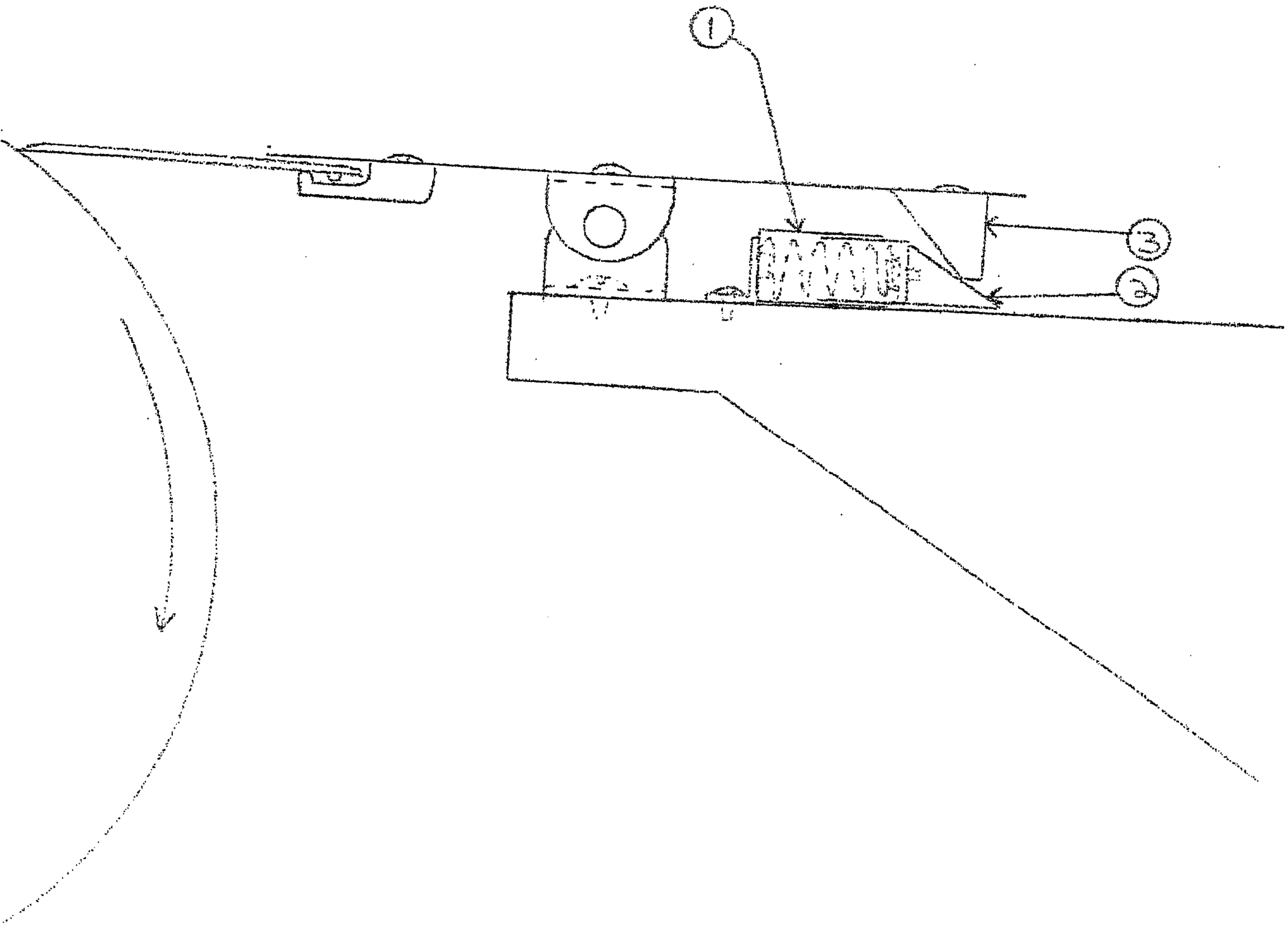


Figure 6

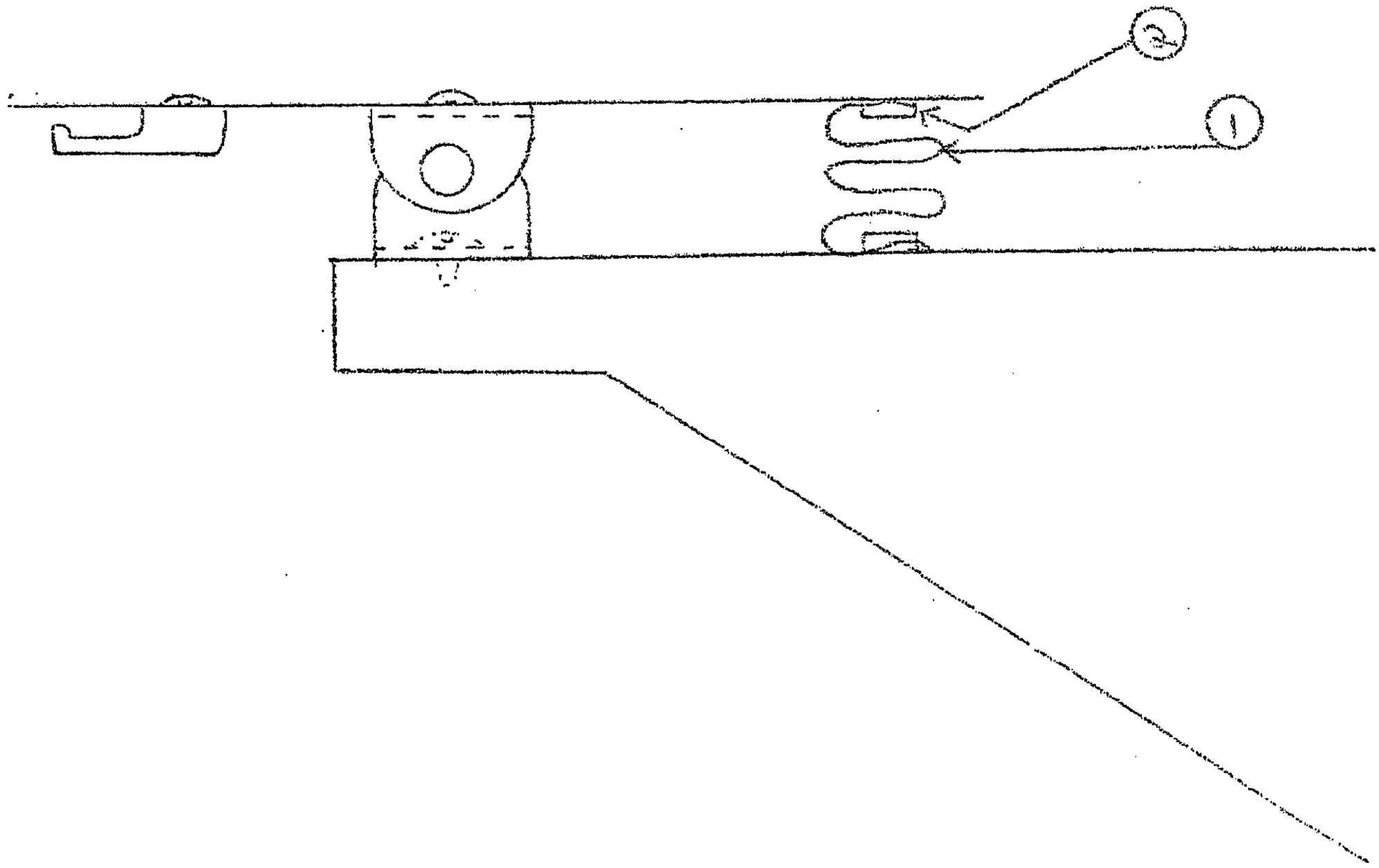


Figure 7

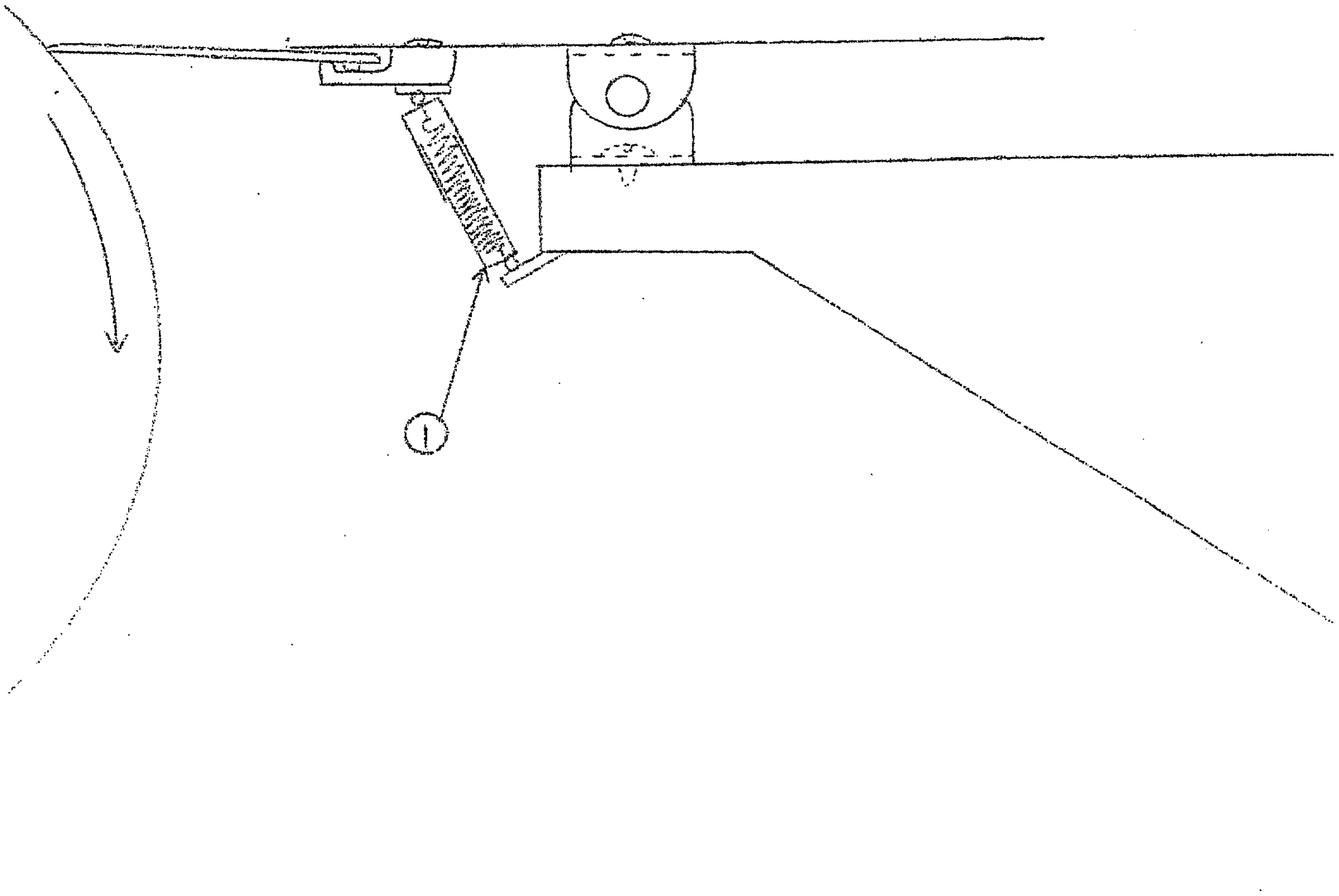


Figure 8a

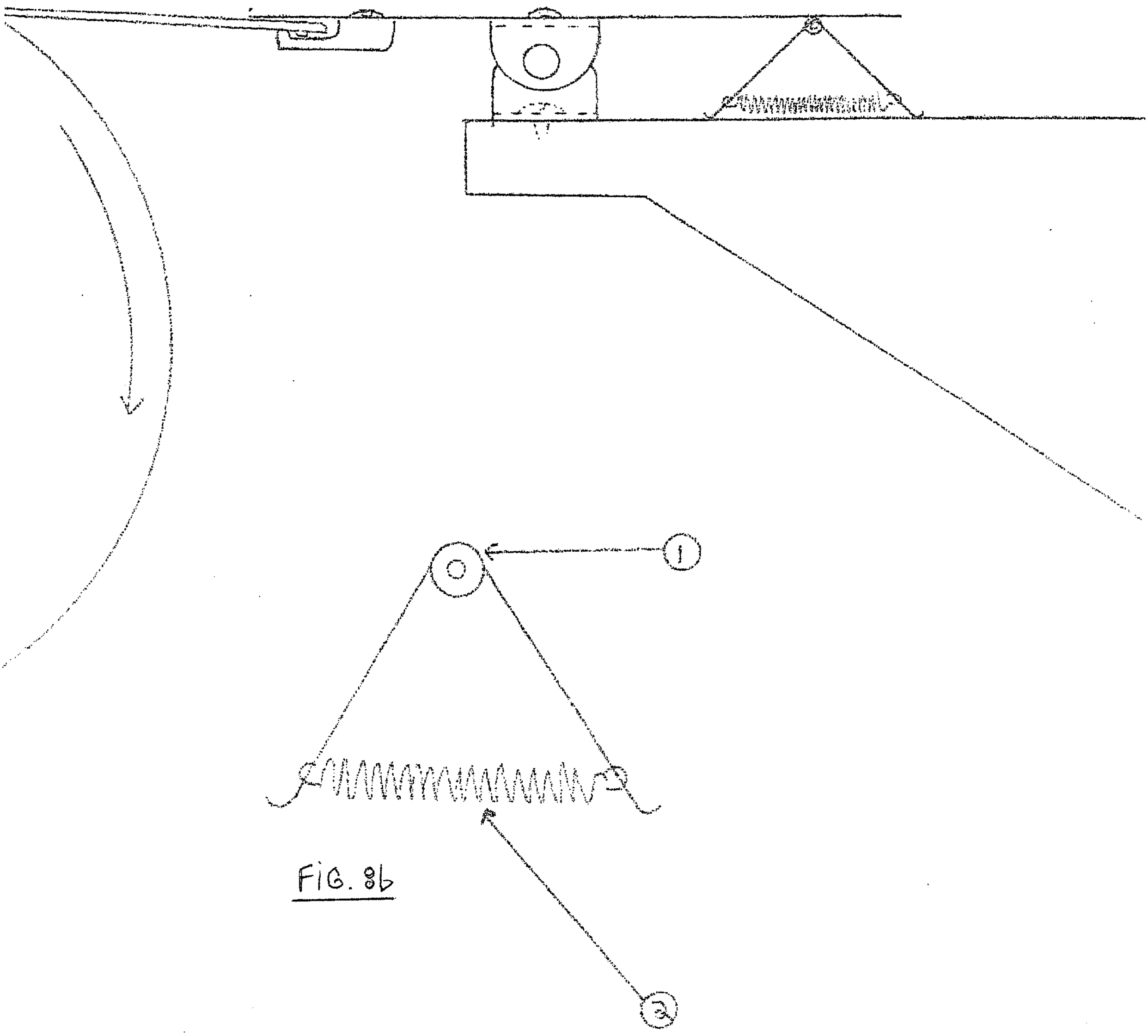


FIG. 8b

Figure 9a

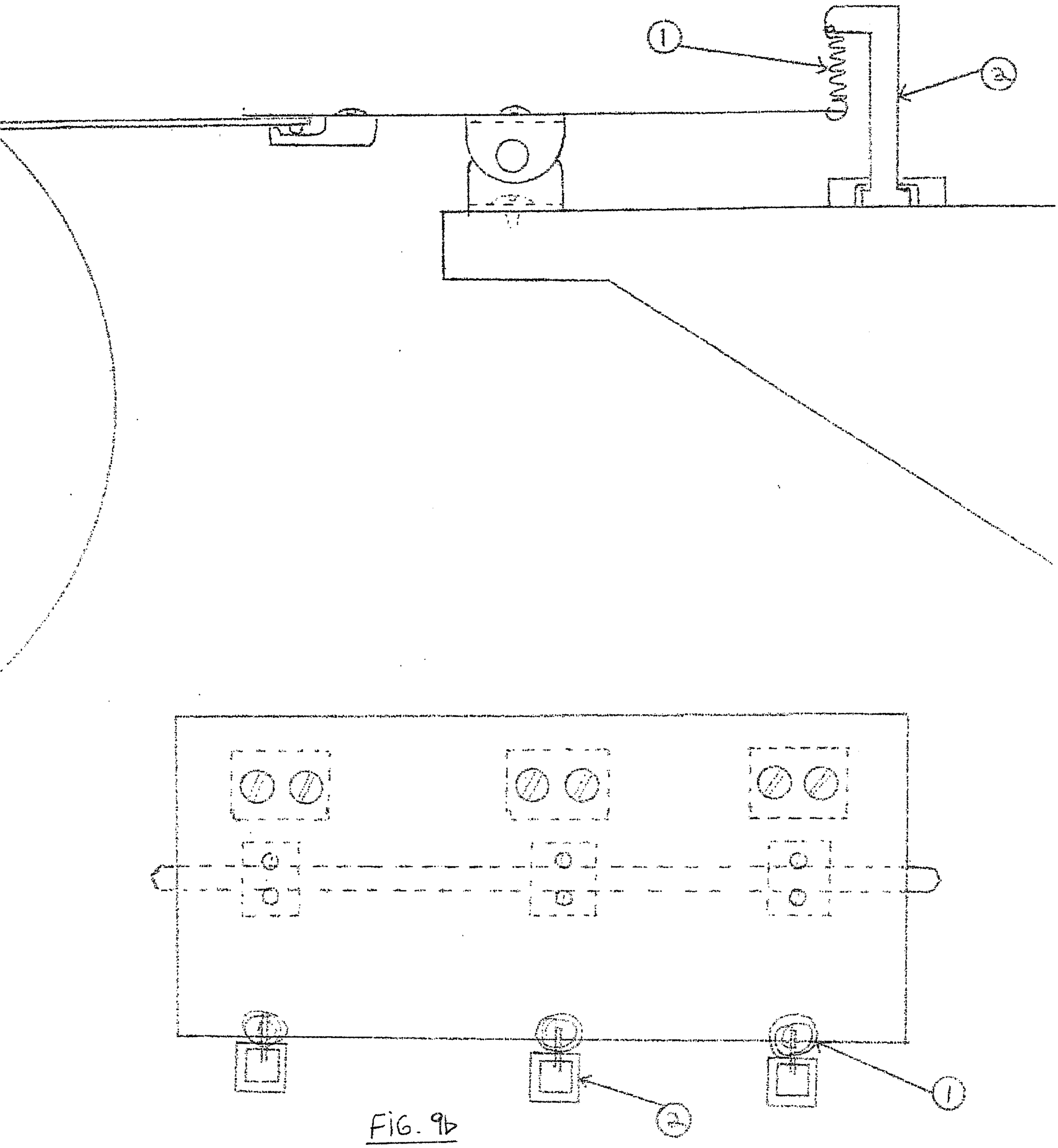


FIG. 9b

Figure 10a

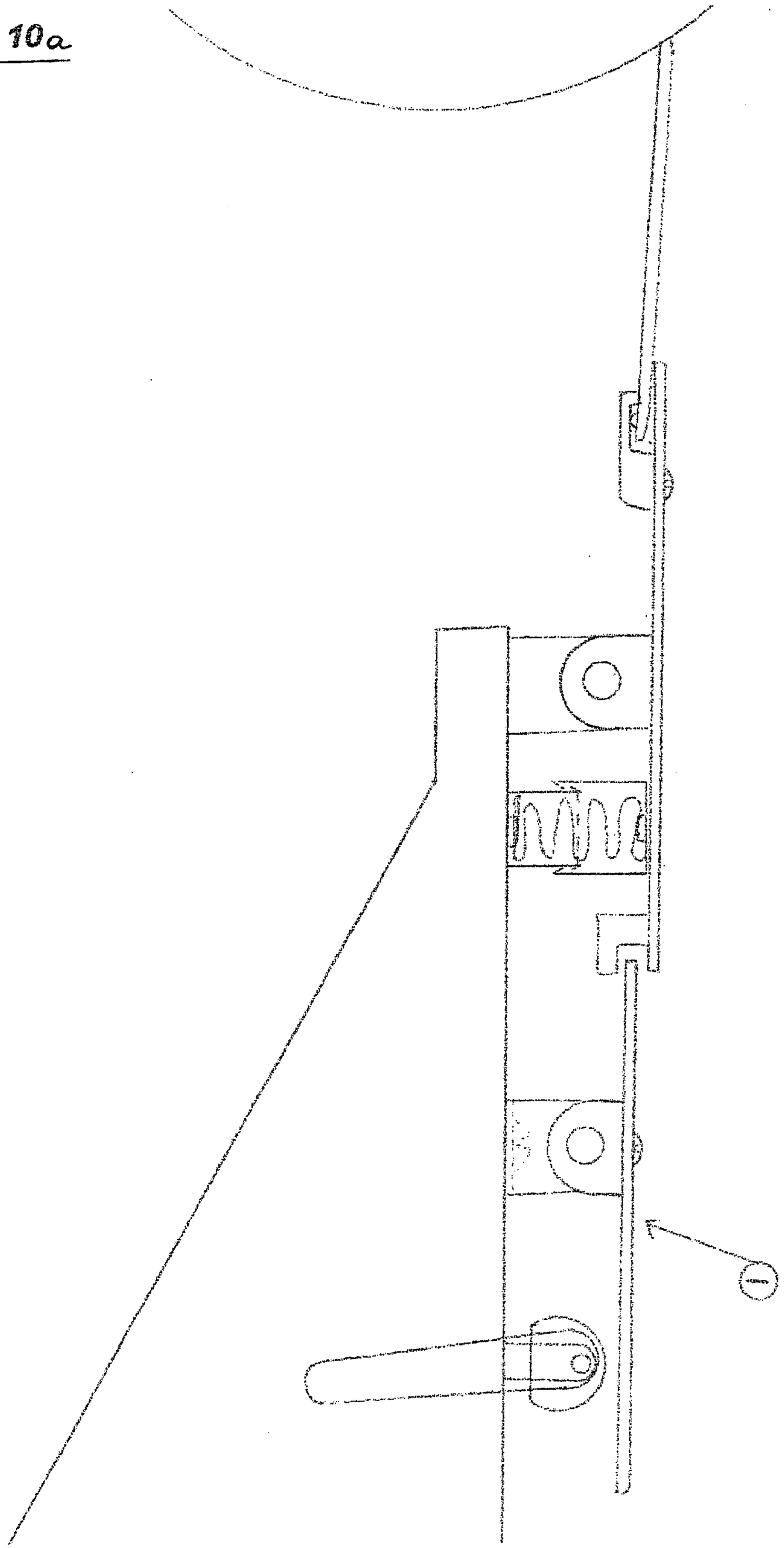


Figure 10b

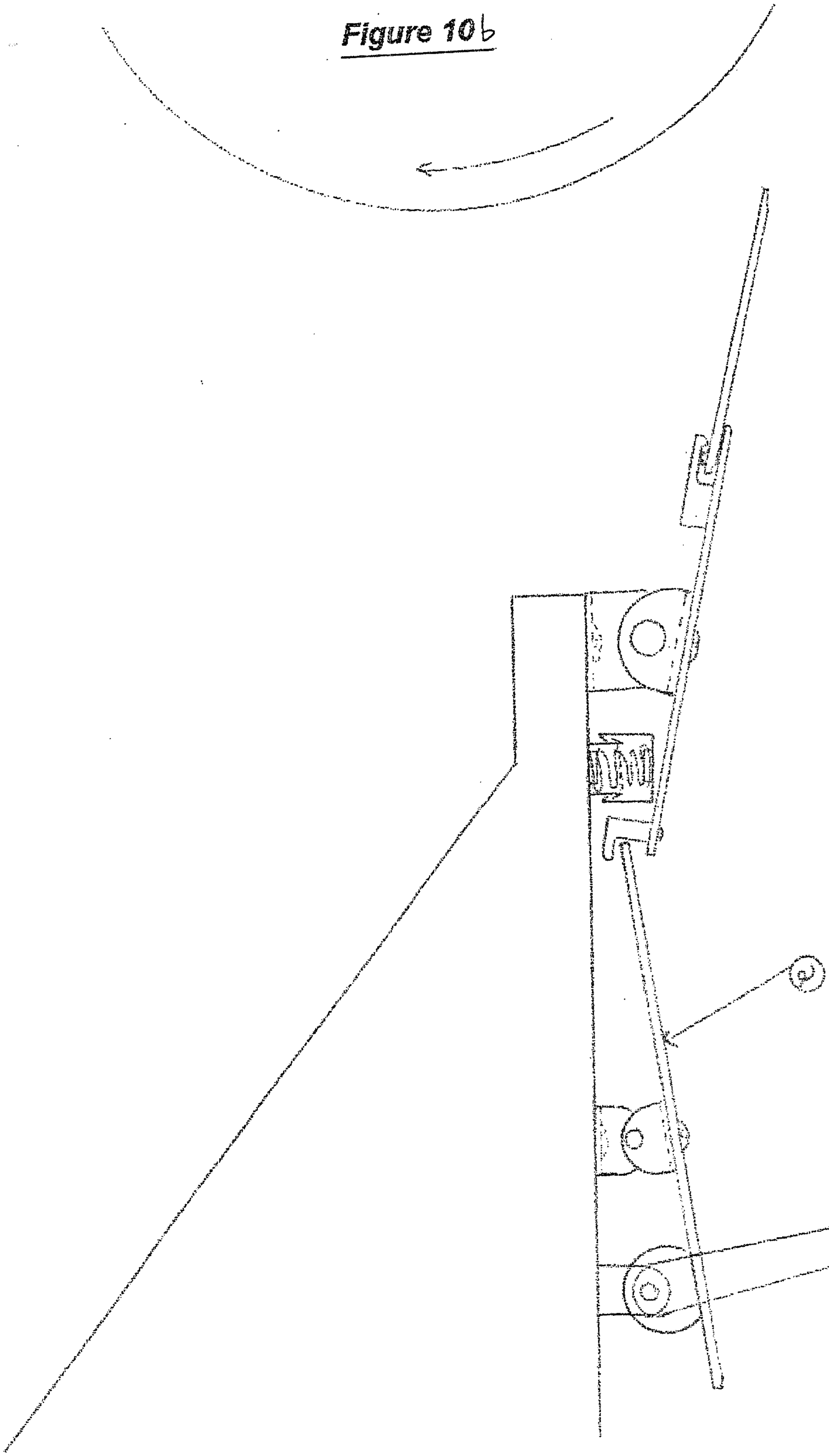


Figure 11a

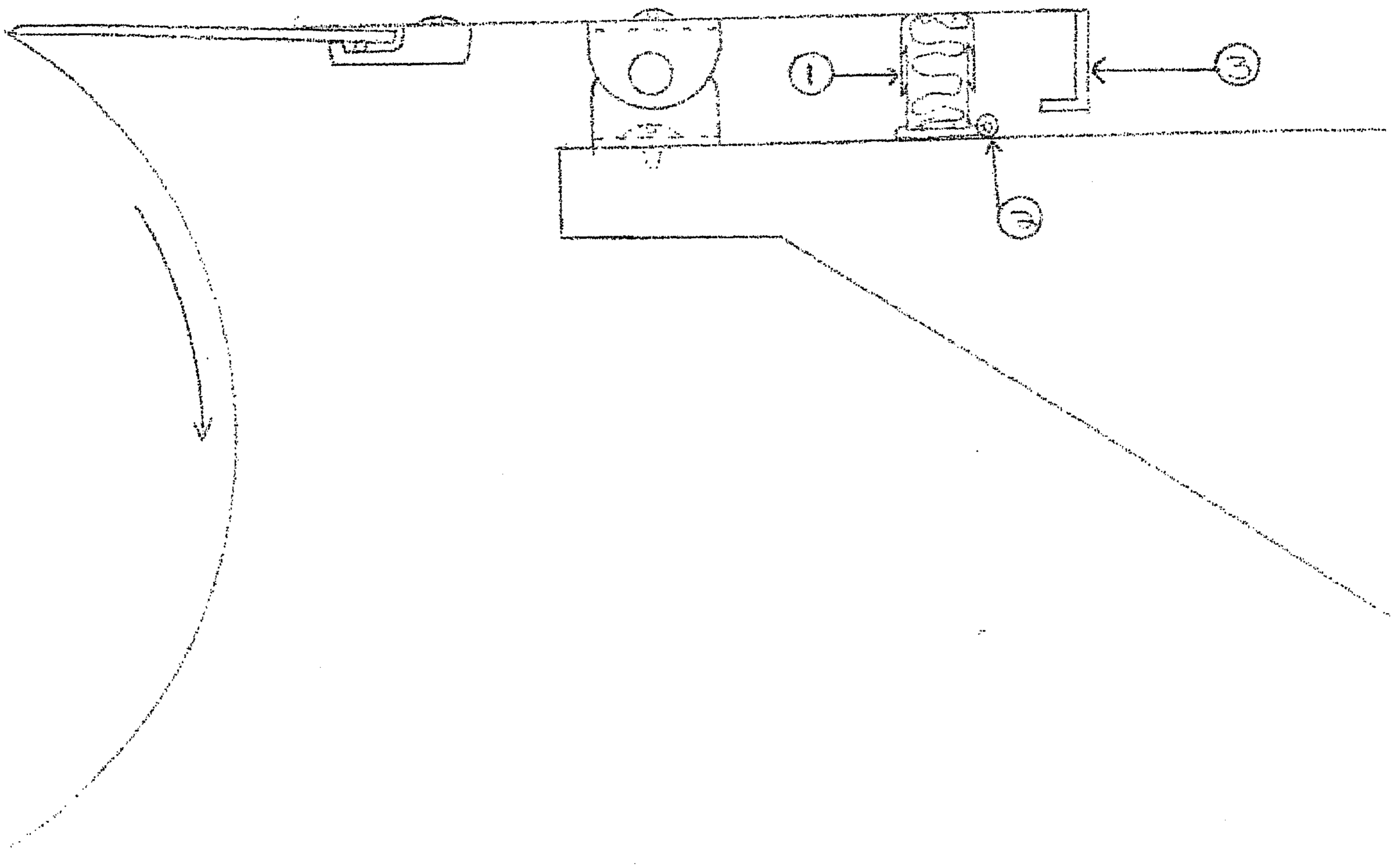
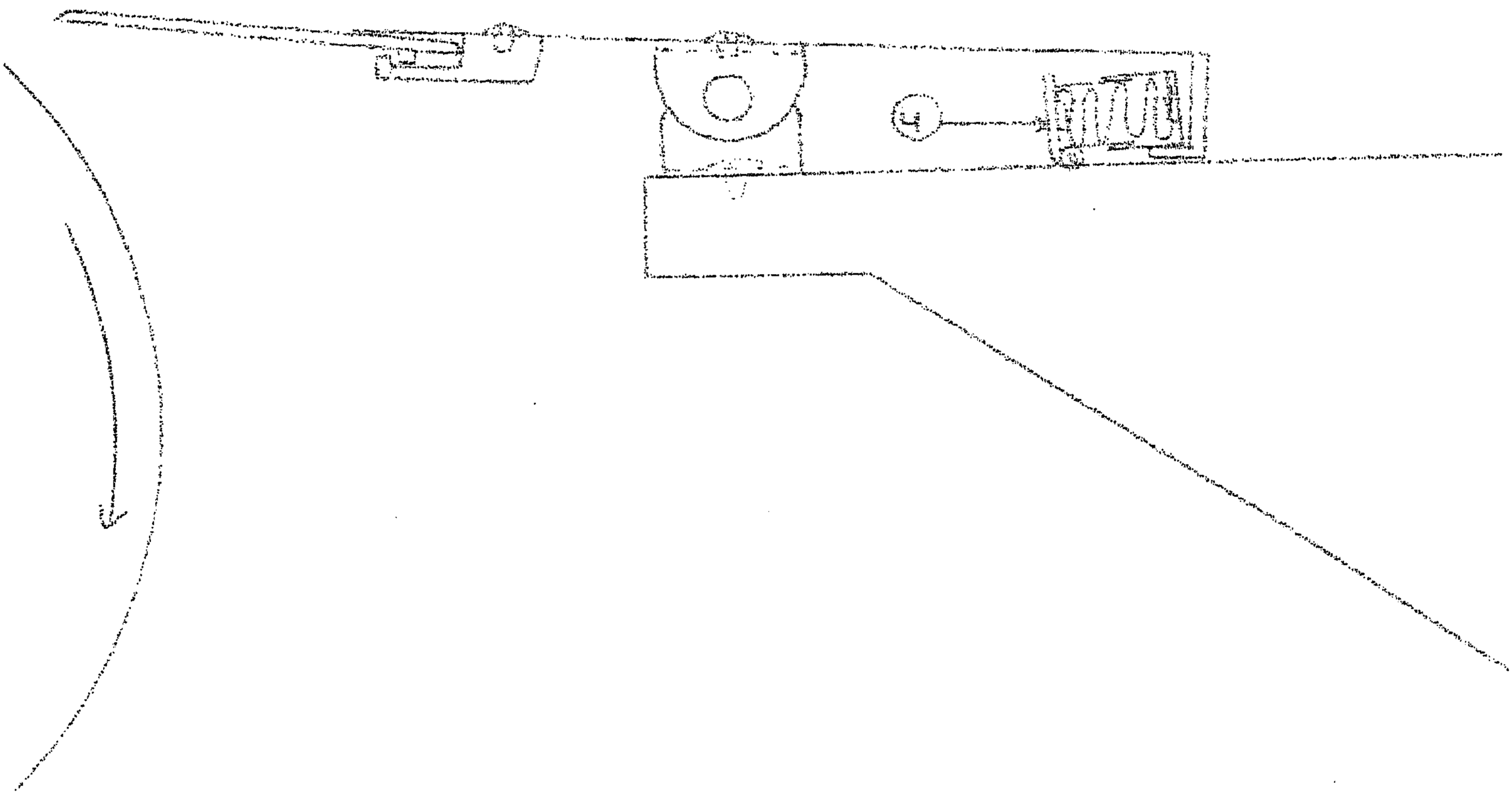


Figure 11b



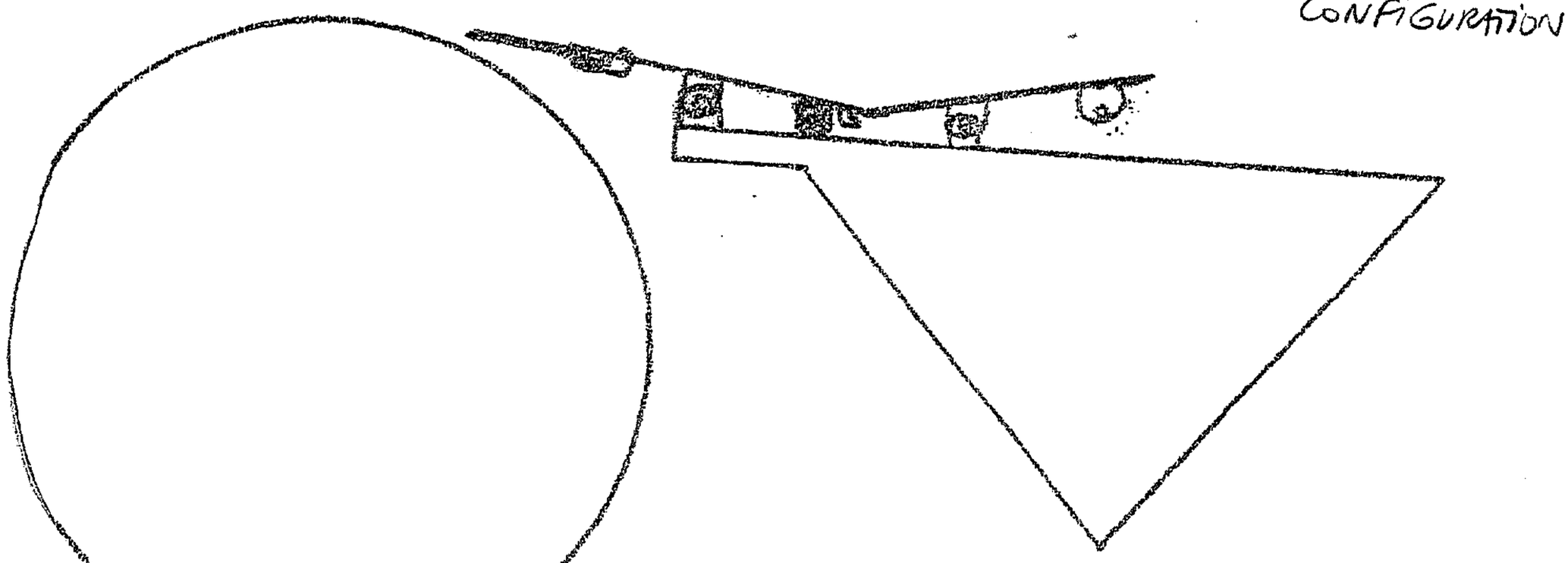


FIG. 12a

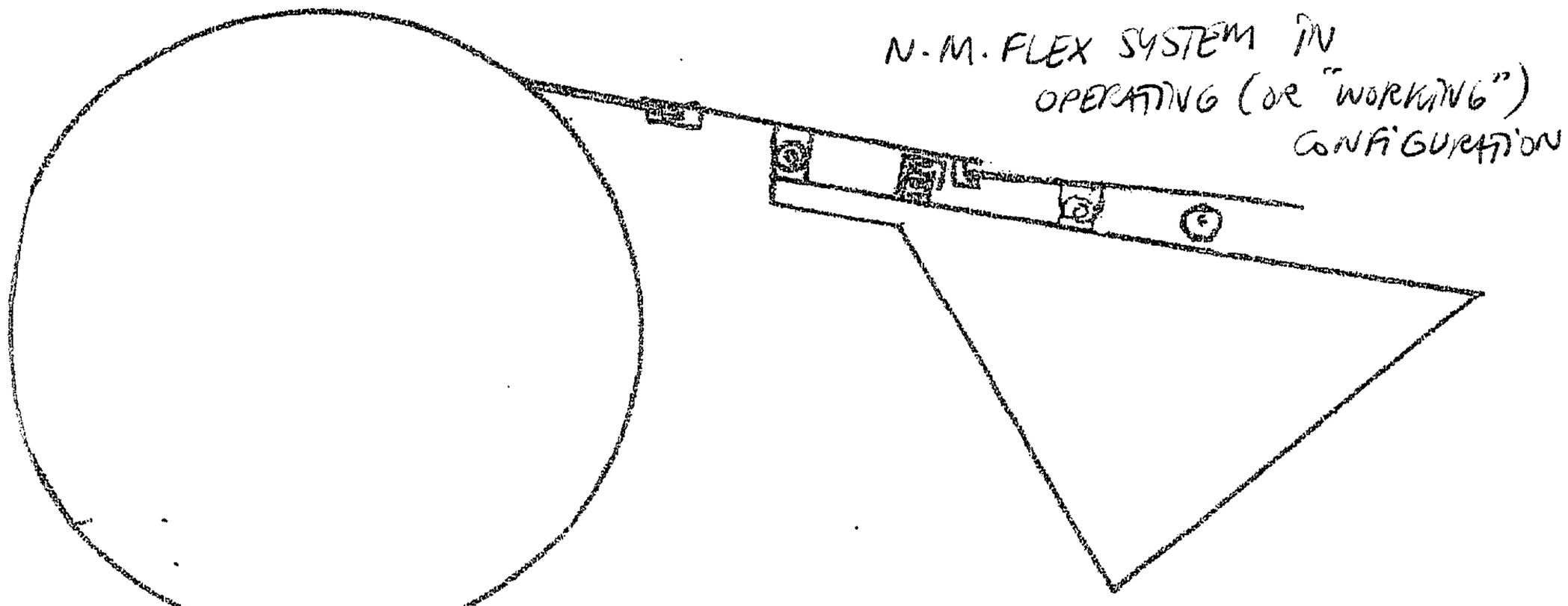


FIG. 12b

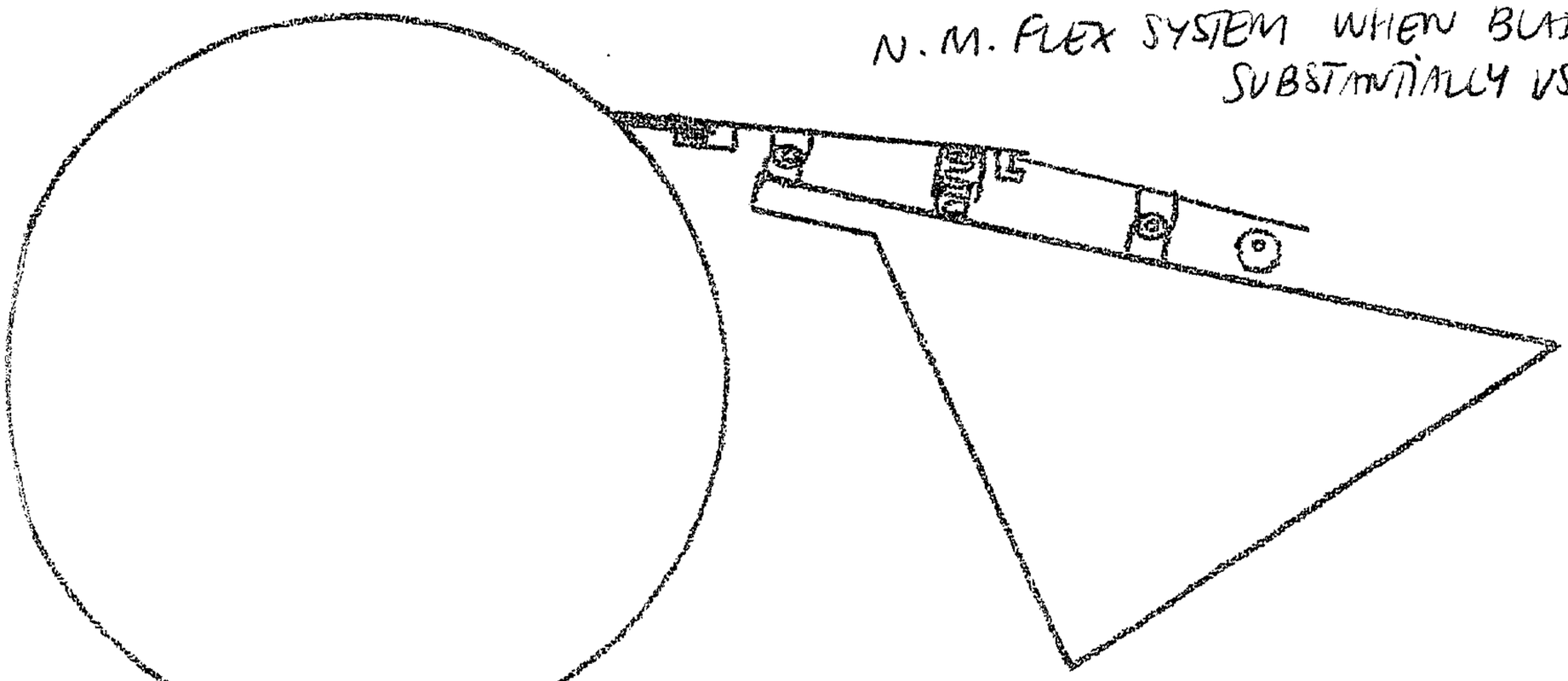


FIG. 12c

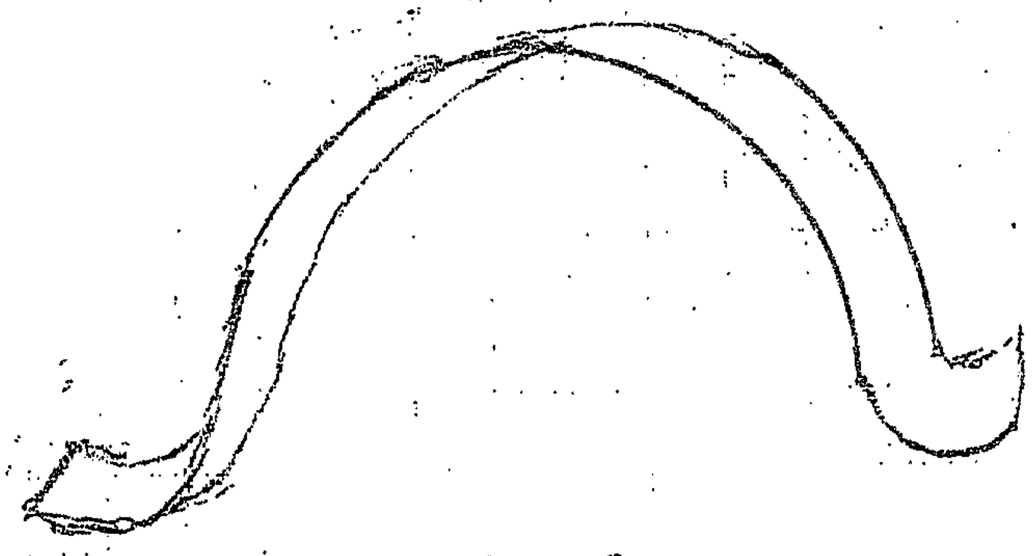


FIG. 13a

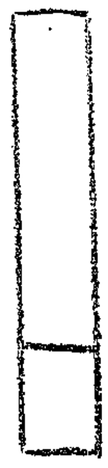


FIG. 13b

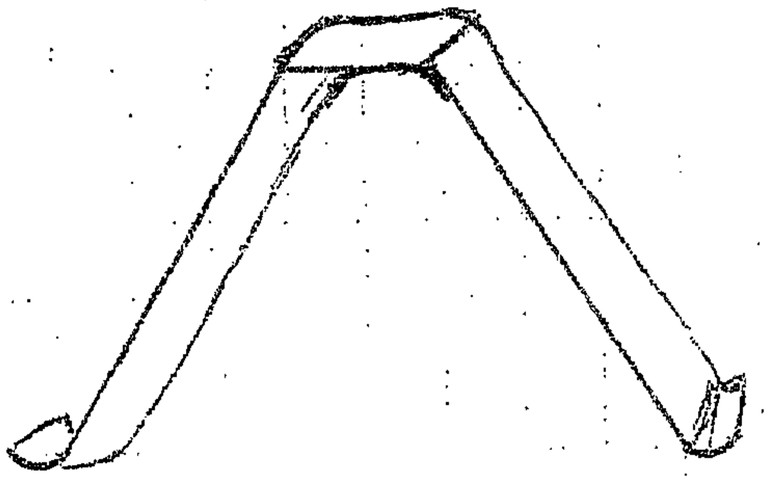


FIG. 14a

FIG. 14b

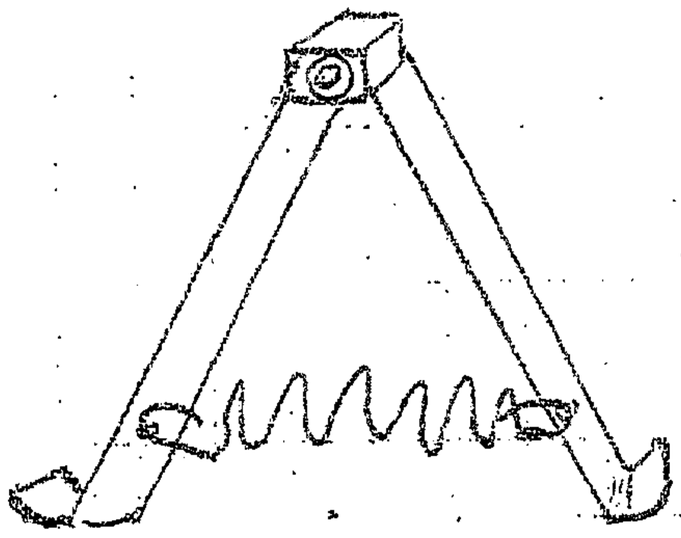


FIG. 15a

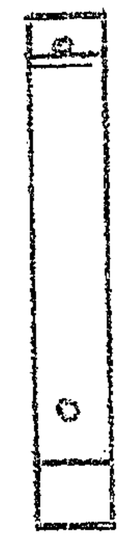


FIG. 15b