

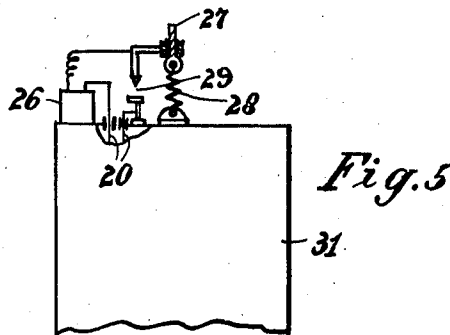
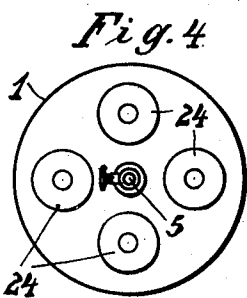
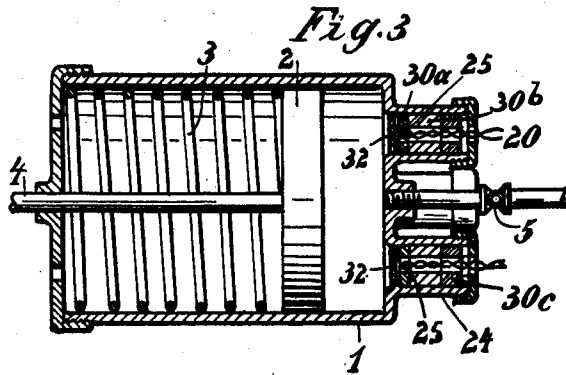
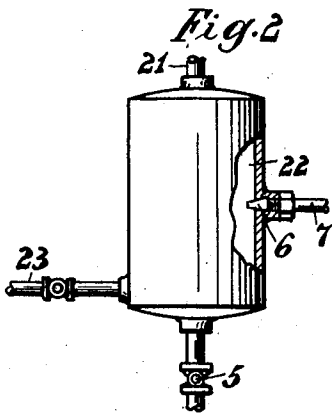
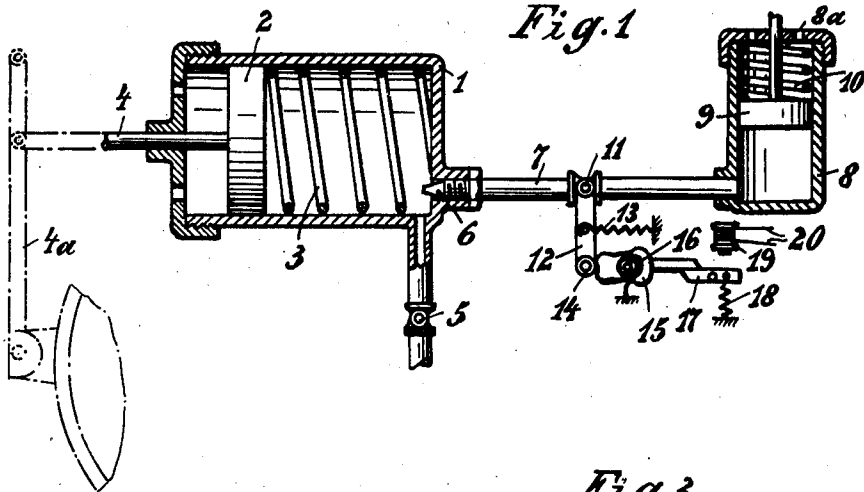
June 15, 1937.

W. KOCHMANN

2,083,654

BRAKING SYSTEM

Filed Nov. 26, 1935



Inventor:
W. Kochmann
By E. F. Olander & Co. Attys

UNITED STATES PATENT OFFICE

2,083,654

BRAKING SYSTEM

Wilhelm Kochmann, Berlin, Germany

Application November 26, 1935, Serial No. 51,667
In Germany February 4, 1926

13 Claims. (Cl. 187—81)

The unpleasant and irritating effect felt by the passengers of a vehicle when the latter is braked sharply is well known, and if the vehicle is a heavy one, the effect concerned may be increased to immediate serious danger.

It is necessary in such cases to consume by the braking forces the kinetic energy of the moving object slowly and gradually in elastic fashion in adaptation to the particular conditions of the material and the degree of retardation to which the passengers may be amenable without detrimental results. Assuming, for example, it is desired to intercept and stop by means of a so-called safety device a lift or elevator falling by reason of a broken rope, that is to say—to intercept a heavy weight moving rapidly downwards, the sudden annihilation of an enormous kinetic energy of this kind, say by a wedge grip gear or an instantaneously acting air brake, for example by the action of the gas derived from an explosive powder on the piston of an air brake, would cause either the braking mechanism itself or the guide beam or the like on which the braking mechanism acts to be damaged or destroyed, rendering any braking effect illusory and resulting in serious injuries to the passengers in the lift or in damage to the material.

The invention relates to brakes of the pneumatic or fluid-pressure type, which at the required moment produce arbitrarily or automatically by chemical reaction the difference in pressure in front of and behind the brake piston, the arrangement being such in accordance with the invention that this pressure is not produced suddenly or in explosive fashion and since the pressure is produced over a certain length of time and not instantaneously, it does not take effect all at once (as in an explosion) but gradually.

This is accomplished by the fact that as agent for producing the over-pressure or under-pressure, that is to say—the difference in pressure in front of and behind the piston resulting in the braking action, there are employed chemical reactions, which are not explosive in themselves and are so controlled or conducted that they take place gradually and preferably with such regulation of the rate of reaction or rate of generation of the gas over the entire range producing the differences in pressure, or at least over important phases of the reaction, that even the nature of the generation of the pressure is more or less adapted to the conditions associated with the consumption of pressure in respect of the type of brake concerned, or may be fully adapted thereto by simple additional mechanical means.

Various examples of the arrangement according to the invention are described in the following without, however, limitation thereto. As a means for obtaining the reduction in pressure necessary for a braking system in which a vacuum acts on the one side of the piston and atmospheric pressure on the other I propose to fill the one part of the brake cylinder, or a container connected with the same, with carbon dioxide or sulphur dioxide, and to inject at the desired moment a suitable liquid, such as a solution of sodium hydrate (NaOH), which absorbs the gas and creates a vacuum. If, for example, SO₂ or NH₃ is used, the absorbent may be water.

For producing the gas pressure for braking systems acting with an over-pressure on the one side of the piston I propose to employ the combustible and gas-pressure generating substances according to my prior Patent No. 1,493,347, which are obtained by depriving explosives of their violent explosive power and causing the same to burn slowly and gradually without explosion.

As an example of the use of the controlled chemical braking system according to the invention reference may be made solely for the purpose of explanation and without involving any limitation to a lift or elevator falling by reason of a broken rope, which is intercepted and held by the movement of a piston in a cylinder under the action of pressure or vacuum, the movement of the piston being transmitted to brake shoes or the like which, in a manner known per se and not constituting part of the present invention, press in turn against a guide beam or rail and thus effect braking. The extent, rate and nature of this braking pressure will naturally vary dependent on the particular type and size of lift concerned. For the purpose of the present example, however, it will be assumed that the pressure is applied in three stages and is such that at first a very rapid movement of the brake shoes is required in order to bridge the space between the same and the guide rail with the least delay and to initiate the braking action with minimum loss of time before the downward momentum becomes too great. There will then be necessary for actual braking purposes a gradual increase of the pressure or the vacuum for the purpose of gradually destroying the kinetic energy, and finally an appreciable increase in pressure will be required definitely to stop the now motionless or little moving lift and hold the same in this position.

The invention will now be described more

fully with reference to the accompanying drawing, in which

Fig. 1 is a section through a braking system according to the invention in which a vacuum is created in regulable fashion by absorption.

Fig. 2 illustrates a modification of Fig. 1.

Fig. 3 shows in section a braking system in which a regulated increase in pressure is obtained by combustible substances according to my said prior Patent No. 1,493,347.

Fig. 4 is an end elevation of Fig. 3.

Fig. 5 shows a means for the automatic actuation of the braking system.

In Fig. 1 the cylinder 1 is filled on the one (right hand) side of the piston 2 with a readily soluble dry gas, such as ammonia or sulphur dioxide of approximately atmospheric pressure or a slightly higher pressure. By the injection of an absorbent, such as water, or a solution of sodium hydrate, a vacuum is created on this side of the piston, whilst the opposite side is acted upon by the atmosphere, so that the piston 2 together with the rod 4 is moved in opposition to the spring 3 and thus actuates a braking device 4a, which latter does not constitute per se part of the present invention. A cock 5 for cleaning and filling purposes is provided in the feed pipe for the gas. The injection nozzle 6 is connected by the feed pipe 7 with the reservoir 8 for the absorbent, which by means of the piston 9 urged by the spring 10 is maintained continuously at the injection pressure. Air is allowed to enter the reservoir 8 behind the piston 9 through the orifice 8a.

In the pipe 7 there is provided a cock or control device 11, which is governed in certain fashion corresponding with the energy requirements of the particular type of brake by means of a lever 12, which is cocked by a spring 13, a roller 14 and a rotatable cam 15 furnished with a spiral spring 16.

In accordance, therefore, with this example the control device 11 is first opened wide for a short space of time, then closed to a certain extent and maintained in this condition for a certain time, and finally again opened wide. There accordingly occurs for a brief period an appreciable absorption and then for a more prolonged period a more or less progressive one and finally again a rapid absorption.

When not in use the control device is held by a locking means, for example the lever 17 and the spring 18. When the rope breaks the lever is withdrawn in any known manner, for example by means of an electro-magnet 19, the lift 31, for example, in accordance with Fig. 5, being supported by the rope 27 through the medium of a spring 28 which, when the rope breaks, relaxes and closes a contact 29 and accordingly also the circuit of the electro-magnet 19.

Fig. 2 shows a modification of the arrangement in Fig. 1, in which there is connected with the cylinder space 1 through the medium of the pipe 21 a container 22, which is also filled with the absorbable gas. The latter is brought into contact with the absorbent in this container and not in the cylinder proper. The principle, however, does not vary. There is also provided a feed cock 23 for the gas and a discharge and cleaning cock 5.

A further embodiment is illustrated in Figs. 3 and 4, in which 24 is the cartridge according to my said prior Patent No. 1,493,347 used for generating gas pressure. Four of these cartridges are so arranged that after one of them

has been used and after completion of the braking action and after the cylinder has been emptied and the spring returned to its original position a new cartridge is ready for use and the braking device is again operable. The cylinder abutment containing the cartridges may be open towards the cylinder 1. If, as in the example shown, there are provided a plurality of cartridges capable of being ignited singly as desired, the respective compartments for these cartridges may be closed by suitable sealing means which protect the reserve cartridges against the pressure of the cartridge which may be in action. These sealing means, therefore, must be capable of intercepting pressure from the cylinder, but at the same time should be destroyed or removed by the internal pressure of the fired cartridge. This effect is obtained, for example, with the aid of the circular members 32 in Fig. 3.

The electrical ignition device 25 for the cartridges is connected by the wires 20 for example with a battery 26 (Fig. 5), the circuit of which is completed by the spring 28 and contact 29 upon the breaking of the rope 27. In the cartridge 24 there is provided the gas-producing substance, which in the present example is again composed of three separate sections, viz., a small quantity 30a, which burns as first of the sections at high speed, a more slowly burning quantity 30b ignited by the first, and a final section 30c, which burns more quickly than 30b but more slowly than 30a.

Naturally for other types of brakes and braking purposes it is possible in similar fashion to select other form and extent of the braking energy by chemical and physical action on the substances or reactions producing the regulated difference in pressure.

Thus, for example, the breaking rope, instead of closing a contact, may also ignite a primer, which in turn fires the substance producing the pressure. Or the breaking rope might also induce other forms of chemical reaction, for example cause the destruction or opening of one or more receptacles, thus introducing an acid and a carbonate into contact with each other, as for example in the known fire-extinguishing apparatus, and causing the generation of the gas.

The remarks set forth in the above relative to the rope of a lift apply also, for example, to the traction rope of a suspension or like railway system or to similar arrangements. The device for generating the gases or the vacuum to produce a difference in pressure may also be employed in similar fashion for like emergencies between tractors and trailers, for railways, tramways, lorries and the like.

It is also possible to employ as mechanical means for initiating the chemical reaction bodies of inertia, such as weights which, in similar fashion to the breaking rope, cause the development of the gases or the vacuum under certain conditions of excessive or undesirable speed or acceleration or also retardation. These modifications of the principles of the invention as described are all based on known means and arrangements, and do not, therefore, require detailed description.

The braking system may naturally also be operated at will, for example by means of a trigger, by the connection of an electric current, by opening an inlet valve, or the like.

What I claim as new and desire to secure by Letters Patent is:

1. In a braking system of the character de-

scribed, a brake cylinder, a member movable in the said cylinder actuating the brake, means for producing by the action of chemicals a difference in pressure on opposite sides of the said member, and means for automatically regulating the said difference in pressure during the action of the braking operation.

2. In a braking system of the character described, a brake cylinder, a member movable in the said cylinder actuating the brake, means for producing by the action of chemicals a difference in pressure on opposite sides of the said member, and means for automatically regulating the said difference in pressure in order to coordinate the braking action to the specific mechanical requirements of a given brake system.

3. In a braking system of the character described, a brake cylinder, a member movable in the said cylinder actuating the brake, means for producing by the action of chemicals a difference in pressure on opposite sides of the said member, means for automatically regulating the said difference in pressure during the braking operation, and means for automatically initiating the said action of the chemicals to produce the said difference in pressure in harmony with the braking pressure necessary at each stage of the braking action.

4. In a braking system of the character described in its application to a conveying means propelled by a source of power, a brake cylinder, a member movable in the said cylinder, means for producing by the action of chemicals a difference in pressure on opposite sides of the said member, means for automatically regulating the said difference in pressure during the braking operation, and means actuated automatically upon failure of the said power source to initiate the action of the chemicals for producing the difference in pressure.

5. In a braking system of the character described in its application to conveying means actuated by a rope, a brake cylinder, a member movable in the said cylinder actuating the brake, means for producing by the action of chemicals a difference in pressure on opposite sides of the said member, means for automatically regulating the said difference in pressure during the braking operation, and means actuated automatically upon the breaking of the said rope to initiate the action of the chemicals for producing the difference in pressure.

6. In a braking system of the character described in its application to conveying means actuated by a rope, a brake cylinder, a member movable in the said cylinder actuating the brake, means for producing by chemical action a difference in pressure on opposite sides of the said member, means for automatically regulating the said difference in pressure during the braking operation, an ignition device for initiating the reaction of the chemicals, and a contact device operated automatically upon the breaking of the said rope for actuating the said ignition means.

7. In a braking system of the character described, a brake cylinder, a member movable in the said cylinder actuating the brake, a non-explosive chemical charge for producing an in-

crease in pressure on the one side of the said member, means for igniting the said charge, and means for automatically regulating the difference in pressure on the two sides of the said member during the braking operation.

8. In a braking system of the character described, a brake cylinder, a member movable in said cylinder actuating a brake, a chemical charge comprising separate sections having different gas producing speed for producing an increase in pressure on one side of said member and means for igniting said sections successively in order to produce variable quantities of gas at different determined speeds.

9. In a braking system of the character described, a brake cylinder, a member movable in the said cylinder actuating the brake, a plurality of chemical charges each comprising separate sections for producing an increase in pressure on the one side of the said member, means for initiating the said charges separately, each of the said charges upon initiation producing gas at different determined speeds, and means for compensating the difference in pressure on the two sides of the said member between the combustion of each two charges.

10. In a braking system of the character described, a brake cylinder, a member movable in the said cylinder actuating the brake, a plurality of chemical charges each comprising separate sections for producing an increase in pressure on the one side of the said member, means for igniting the said charges separately, and means for protecting the reserve charges during the reaction of any one charge from the action of the latter.

11. In a braking system of the character described, a conveying means, means for transmitting power from a source of power to said conveying means in order to propel the same, a brake cylinder, a member movable in said brake cylinder, means for producing by the action of chemicals a difference in pressure on opposite sides of the said member, means for automatically regulating the said difference in pressure during the braking operation, and means actuated automatically upon failure of said power transmitting means to initiate the action of the chemicals for producing the difference in pressure.

12. In a braking system of the character described, a brake cylinder, a member movable in the said cylinder actuating the brake, a plurality of chemical charges each comprising separate sections for producing upon initiation an increase in pressure on one side of said member at determined speed, means for initiating the said charges separately and means for compensating the difference in pressure on the two sides of said member between the combustion of each two charges.

13. In a braking system of the character described, a brake cylinder, a member movable in said cylinder actuating a brake, a chemical charge comprising separate sections having different gas producing speeds for producing an increase in pressure on one side of said member and means for igniting said sections in order to produce variable quantities of gas at different determined speeds.

WILHELM KOCHMANN.