

The invention relates to a device for a protection against the influence of water, having at least one water absorbing body which includes a water permeable jacket, of which the jacket material consists in a non-woven of synthetic fibres and which forms an expandable, closed inner space which contains a superabsorber material which is combined with a wadding-like supporting layer, see US-A-4 650 368.

As is generally known, destructive influences can emanate from water in various situations. In the case of flooding, it penetrates e.g. into houses or crops and produces damages. In such cases damming means to hold off water and to redirect the water are needed. Similar is true for the flow-off of fire extinguishing water in the case of a fire. Because this water is often contaminated, its penetration into the sewerage or into waters must be prevented by means of dams.

Commonly, sand bags are used for such damming purposes. These have the drawback that they feature a large storage and transporting volume and weight. It is, therefore, difficult to transport and to place enough sand bags in the case of an emergency. Furthermore, they have exclusively a damming effect so that the damaging amount of water is not reduced but is rather merely redirected. Therefore, additionally pumps and similar are needed when the water is to be removed.

It has been proposed in the US-A-4 650 368 to enclose so-called superabsorber-material in water permeable jackets which swells upon contact with water and expands the jacket to a full body, whereby simultaneously water is bound. Polyethylene or polypropylene material has been foreseen for such material of the jacket, which is equipped with openings or holes in such a manner that water can penetrate through the jacket into its inner space.

It has now been recognized that with the proposed solution the water is absorbed not fast enough or in too small amounts, respectively, such that the water can

flow over the jackets which have been spread out and that in a first phase the fire extinguishing water or similar is not bound sufficiently.

Because the bringing into operation of such means in emergencies, such as fires, is a question of time, it is possible that at least during a first phase damages by the influence of water may still occur.

From this background there is thus the object to modify and improve the protection device known by the US-PS 4 650 368 in such a manner that the absorption of water can proceed considerably faster, whereby neither the dry nor the wet superabsorber material nor the once taken up water can leave the jacket. The jacket must be rupture-proof and stable in a wet state in such a manner that it can sustain the considerable weight of the swollen superabsorber during transporting off.

The solution of this object proceeds from the features mentioned in patent claim 1.

It has surprisingly been proved that by such a design the opposite demands of a large stability of the jacket at an excellent water permeability from the outside and at an excellent keep capability from the inside can be fulfilled in an optimal manner and specifically at a minimal pore size of the non-woven below 10 μm . This again allows to enclose the superabsorber material as extremely fine powder with correspondingly small grain sizes in the jacket without encountering the danger that the powder exits the jacket in its dry state through the non-woven. Because the speed and the efficiency of the binding of the water increases at small grain sizes of the superabsorber material, it is possible to increase and accelerate the binding of the water inside of the jacket additionally to the water penetration through the jacket by the inventive material of the jacket. This altogether leads to a substantial improvement of the effectiveness of the protection device.

Several embodiments of the invention will now

be explained hereafter more in detail based on the drawings.
To this end there is shown in :

Fig. 1 a first, cushion-like protection device
in a dry state in a top view;

Fig. 2 a schematic sectional view along line
II-II in figure 1;

Fig. 3 the protection device according to fig.1
in a wet state;

Fig. 4 a second embodiment with bellows-like
walls in a dry state in a side view;

Fig. 5 the embodiment of figure 4 in a wet state
in a schematic section view;

Fig. 6 a hose-like embodiment in a partially
placed state;

Fig. 7 the embodiment of figure 6 in a wet state;

Fig. 8 a further embodiment with a mounting flap
in a wet state;

Fig. 9 an embodiment designed as cover of a pit
in a wet state;

Fig. 10 a hose-like embodiment in a wet state.

The protection device according to the invention makes use of a superabsorber material such as e.g. known as so-called superabsorber polymers (SAP). Such superabsorber polymers are e.g. cross-linked acrylic acid polymers, sodium polyacrylates grafted to starch, compounds of isobutylene maleic acid anhydride copolymers or hydrolyzed grafting copolymers of starch and polyacrylonitrile. Such materials are available as powders e.g. under the trade marks Salsorb (Allied Colloid Ltd.), Sannet (Celanese) or Ki-Gel (Kuraray). They feature the already mentioned property of binding amounts of water under massive volume increase, which amounts of water correspond to a multiple amount of their volume proper and of their weight proper.

The protection device (see specifically figures 1 to 3) includes members with a jacket 1 made of a polyester non-woven. The non-woven material of polyester fibres has such a density that its pores have a size below 5 to 10 μm .

Accordingly, the non-woven is rupture-proof enough also in a wet state so that it can sustain the loadings which appear in this application. Surprisingly, the non-woven is extremely permeable by water also with such a small pore size.

The superabsorber material is arranged distributively within the jacket 1 and has small grain sizes. The small grain sizes are advantageous because the speed of the water absorption is increased thereby. This is of importance with regard to the present application. A grain size distribution between 0 and 800 μm grain diameter has proved to be optimal. By the small size of the pores of the non-woven, it is possible to prevent the fine portions of the powder from flowing out of the jacket. This is of specific importance for the storage and transport of the protection devices because the speed of the soaking up of water decreases when the fine portions of the powder are lost.

A predetermined amount of superabsorber material is arranged within the jacket 1. The amount is thereby set with reference to the cut size of the jacket 1 that the volume generated during the water absorption corresponds to the inner volume of the expanded jacket which can be obtained.

The powder-like superabsorber material is, furthermore, distributed as well as possible inside the jacket such that no forming of lumps occurs when it comes into contact with water. To this end, the powder is distributed in a fluff-layer having a thickness of about 5 to 7 mm. Hereto the powder is sucked-in during the production by means of sub-atmospheric pressure in this wadding-like fibre layer.

A fluff-layer 6 is schematically indicated in the embodiment according to the figures 1 to 3.

According to figures 1 to 3 the jacket shows a cushion-like shape. Planar sheets of a polyester non-woven of the mentioned structure are connected along their edge 2 by means of a water-tight bonding agent. At one side, a broadened edge 4 forms gripping holes 5. Inside of the jacket formed in this way the superabsorber material is arranged distributively over the surface. Hereto the fluff-layer 6

is placed into the jacket, whereby a uniform arrangement of the superabsorber distributed over the entire volume is arrived at in any position of the jacket. Of importance thereby is the distribution over the surface and also an arrangement which is accessible for water.

In the dry state, the jacket 1 of an element according to the embodiment of figure 1 is completely planar (see fig. 2) and needs little storage space. It has dimensions of about 80x40 cm and contains about 100 gr superabsorber of the above mentioned kind, wherewith a water absorption capability of about 200 gr of water per gram of powder is arrived at. The dry weight of the protection device is thus negligibly low. At a water contact about 20 liters of water are absorbed and the weight increases to about 20 kilos. The element according to figures 1 and 2 is illustrated in this state in figure 3. As can be seen, it expands to a cushion or bag having a weight of about 20 kilos.

If several such jackets 1 are placed side by side and in several layers one after the other, they speedily bind in a first phase a large amount of (extinguishing) water and act thereafter as a dam. In case where this seems to be sensible, expanded elements can be continuously exchanged against dry jackets or be supplemented by dry jackets. Due to the low dry volume and dry weight, it is possible to build, supplement and exchange dams very speedily.

The volume of the jacket and the amount of superabsorber material is preferably dimensioned in such a manner that one respective expanded cushion can be carried by one or two persons. It is preferably in the range between 15 and maximal 50 kilos wet weight. The water permeable jacket must be structured in such a manner that it can withstand this weight and does not rupture when being transported off. For this reason, the polyester non-woven used for the jacket 1 displays a maximal pulling strength of about 100 N/5 cm according to DIN 53857. For facilitating the transporting off, gripping holes 5 are, furthermore, foreseen in the edge 4 (see figure 1).

Instead of the cushion-like shape illustrated in figures 1 to 3, the jacket can also have other shapes. In order to improve the mutual arresting of cushions placed onto each other for forming dams, the jacket e.g. of the cushion illustrated in fig. 1 can have in the centre additionally a bonding area 9 such that it possesses in the expanded state a recess at its centre, in which a cushion lying thereupon and somewhat displaced sideways can engage.

The jacket can, furthermore, be of a bellows-like shape such as illustrated in figures 4 and 5. In the dry state, the side walls 7 are folded together in a bellows-like manner (fig. 4) and unfold during the expanding of the superabsorbing material. The thus formed body has a substantially square shape which facilitates the structuring of dams and the piling when transporting off. Also here the jacket 1 is equipped with a carrying grip 8.

Such jackets can also be interconnected through hose-like elements 10 which can be transported e.g. in the form of rolls as illustrated in figure 6. By means of this, it is possible to speedily obtain dams and surface coverings by a simple unrolling. In order to allow the transporting off of the device in its wet state, the hose-like element 10 is divided into individual chambers 11 which can be separated from each other. Hereto two bellows-like folded side walls 7 are foreseen at each severing location 12. The severing location 12 can be formed by a Velcro fastener arrangement or any other arrangement which can be easily opened. The fastener must take up only small forces because it merely has to keep the various chambers together when being unrolled. In figure 7 a part of the mentioned hose-like element is illustrated in the wet state. The individual chambers 11 lie against each other side by side and form in this way a dam. In order to be transported off, one chamber after the other can be severed and be loaded separately, whereto also carrying grips 8 are foreseen.

Figure 10 illustrates furthermore a hose-like element which cannot be separated into individual parts.

The embodiment according to figure 10 has thereby a semi-circular cross-section in a wet state, which includes a planar bottom 33 which forms a stable and sealing resting area. The embodiment according to figure 10 can be stored in a dry state in the shape of rolls which allows a very fast placing. The elements form a tight dam having as such an arbitrary length.

The specific weight of a cushion or a chamber of the described type in the wet state amounts to about the range of the specific weight of water, which obviously is its main ingredient. As long as the water level is lower than the height of the expanded element, there is no danger that the element can be carried away by water. A dam remains, therefore, active as long as the water level is relatively low, which is the case e.g. at fire extinguishing water flowing off.

At dams in areas of higher water levels the elements of the protection device must be weighed down or firmly mounted. In figure 8 the example of such an element is illustrated in its wet state. A flap 14 is set onto the jacket 1, onto which e.g. loading weights can be placed. The flap includes, furthermore, eyelets 15 by means of which the element can be mounted to the ground or the neighbouring elements. The flap can thereby be integrated in the bottom 16 of the elements and be together with same of a water-tight material, which has a sealing function against the ground. This is specifically of importance when the element is used e.g. as cover for a pit.

In figure 9, finally, a further element is illustrated which specifically acts as a cover 20 for a pit and which has a substantially ring or dish-like shape. The bottom 21 is preferably formed by a water-tight foil. The centre recess 22 serves for the weighing down of the pit cover. Carrying grips 8 serve for a facilitating of removal in the wet state.

In the dry state, the elements of the various embodiments are planar or rolled up. In order to prevent

an early contact with water during storage or transport, they are arranged in water-tight packagings. Due to their low weight, a plurality of jackets can be contained in one package in their dry state. In use, the jackets are removed from the packages and operated such as set forth above.

After the use, the expanded elements are collected and stored at a drying area. This can e.g. be a covered, strongly ventilated hall. The water which has been absorbed evaporates, whereafter the volume is again reduced. The elements can be used only once, because the superabsorber material changes in an irreversible manner when absorbing water. It is, therefore, of importance that the used and dried jackets made of a polyester non-woven can be done away with unhesitatingly by burning. If the absorbed water was contaminated, the corresponding materials remain in the jacket. Instead of a large volume of fire extinguishing water, the dried jackets can in such a case be further treated suitably.

The application of the illustrated device is not restricted to fires and other disasters. It can, for instance, also be used to absorb residual amounts of water speedily which cannot be removed by a pump due to a too low level.

Furthermore, for specific cases it can be foreseen to mix the superabsorber material in order to increase the weight and to obtain a thinning effect with dry, inorganic materials. Suitable thereto are roughly talcum, quartz sand, kaolin, chalk, rock dust, barium sulfate or kieselguhr. By means of these, the dry weight is increased, but it can be done away with a loading or arresting, respectively, of the elements.



Patent Claims

1. Device for a protection against the influence of water, having at least one water absorbing body which includes a water permeable jacket (1) of which the jacket material consists in a non-woven of synthetic fibres and which forms an expandable, closed inner space which contains a superabsorber material which is combined with a wadding-like supporting layer (6), characterized in that a water permeable fibrous non-woven of polyester fibres with pores of a size below 10 μm is foreseen as jacket material and in that the superabsorber powder with a grain size of maximal 800 μm is arranged distributively in the wadding-like supporting layer of a fluff-material.

2. Protection device according to claim 1, characterized in that the powder-like superabsorber material has a grain size distributed in the range between 0 and 800 μm .

3. Protection device according to claim 1, characterized in that the jacket (1) has the shape of a bag, cushion or hose.

4. Protection device according to one of the preceding claims, characterized in that a part (7) of the jacket (1) is folded in a bellows-like manner for an expanding of the inner space.

5. Protection device according to one of the preceding claims, characterized in that the jacket (1) in a dry state is formed substantially flat.

6. Protection device according to one of the preceding claims, whereby the jacket (1) is of a hose-like shape, characterized in that the hose (10) includes severing areas (12) for a severing of hose portions.

7. Protection device according to one of the claims 1 to 6, characterized in that the jacket (1) has a ring-like shape (20).

8. Protection device according to one of the



preceding claims, characterized in that carrying grips (5; 8) are arranged at the outside of the jacket.

9. Protection device according to one of the preceding claims, characterized in that flaps (14) for an arresting or weighing down of the device are arranged at the jacket (1).

10. Protection device according to claim 8, characterized in that the carrying grips are foreseen as recesses (5) in the material of the jacket.