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(54) **Unit for transportation of car brake discs**

(57) A unit for transportation of car brake discs (3) is a collective packaging in the form of a transport box (1) and cases (2.1,2.2,2.3,2.4) in the form of packages for discs. Each case (2.1,2.2,2.3,2.4) is a flat container with width, height and depth corresponding to the dimensions of the brake disc (3). The front wall (4) of the case

(2.1,2.2,2.3,2.4) contains a recess (5) with width and height greater than the dimensions of the brake disc (3) sleeve (6). One vertical side wall (7) of the case is fixed tiltably to the case, whereas in at least one of the other side walls of the case there is at least one seating for fixing the case (2.1,2.2,2.3,2.4) in the transport box (1).

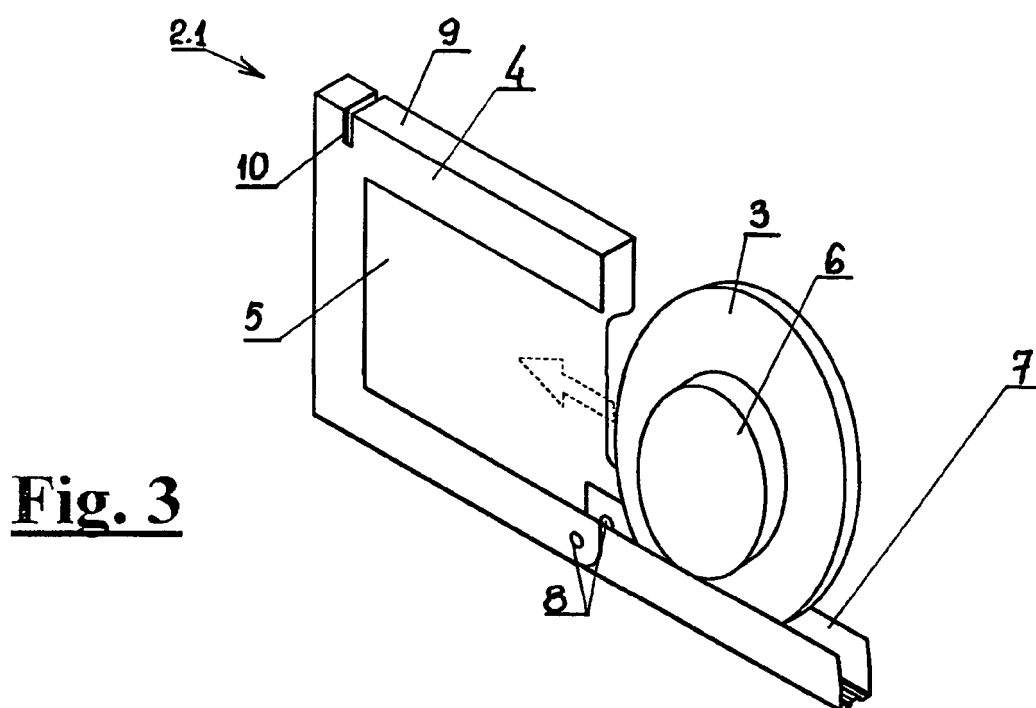


Fig. 3

Description

[0001] The subject of the invention is a unit for transportation and storage of car brake discs. The unit comprises a collective container of packages containing single car brake discs inside.

[0002] A brake disc is the main element of a car disc brake. A disc comprises a peripheral flange with which brake shoes cooperate when the vehicle brakes, and comprises a sleeve through which the disc is fixed on the axle of the vehicle, and on which a car wheel rim is mounted. The height of the sleeve is substantially greater than the thickness of the peripheral flange, which makes it difficult to stack discs on top of one another, and the transportation of discs between stands in the manufacturing process is hindered, as well as in the process of their transportation to the end user. In both cases a lot of damage is observed which disqualify damaged discs for further processing, or for final assembly in a motor vehicle.

[0003] The protection of car brake discs in inter-operation transportation at the manufacturer as well as in transportation to the end user involves placing individual discs in cardboard boxes. However, a cardboard box is insufficient for significant loads resulting from the arrangement of discs packed in such a manner and stacked on top of one another and additional loads resulting from dynamic conditions of transportation to the customer. Known solutions developed with a view to the transportation of three-dimensional products, also involving car brake discs are presented below.

[0004] The solution known from the patent specification of international application No. WO 2010/041024, presents a rectangular thermoformed protective packaging containing four flanges on one of the walls that enable the closing of the packaging. The flanges are shock-absorbing elements. Objects that are inside are protected from damage by resilient projections protruding inwardly being parts of the packaging.

[0005] Another known solution of a transport container for three-dimensional products is presented in the patent specification of international application No. WO 2009/021275. According to this known solution, a container has a pair of side walls, rear wall, bottom wall and top wall. The side walls and the upper and bottom walls contain overlapping hinged flaps, wherein the flap of the bottom wall and the flap of the top wall overlap at least partially.

[0006] Another known solution is presented in the patent specification of international application No. WO 2008/093631. According to this known solution, a packaging body has a honeycomb structure. The upper and lower trays of the packaging have pockets comprising seats for placing elements of the packaged product in them. Both trays are in shallow cardboard tray packs, so that there is space between tray packs facilitating maneuvering the packaging and its content.

[0007] Another solution known from patent specifica-

tion No. WO 2008/068232 presents a protective container for transportation and storage of round elements. The protective container, according to this known solution, comprises a matching cover and a floor. Between them there is a side board carried by the floor edges and a flexible pin for blocking the board through its hole. The bottom board also contains flexible projections for carrying the central board.

[0008] The packing system for shipping three-dimensional articles is also disclosed in international application No. WO 2006/066106. In this known solution a packaging kit comprises a container representing the actual packaging and an internal insert, wherein the insert includes at least one cut-out section that is adapted to the shape of the article to be packed.

[0009] Another known packaging solution for small objects and the manner of their packing is presented in the patent specification of European application EP 0256591. In this known solution the base is a multilayer composite plate comprising a non-deformable base plate and an elastic non-deformable layer fixedly connected to the base plate, where objects to be shipped are pressed into carrier layers in the non-deformable plastic material.

[0010] US patent specification No. US 2007/0051660 presents a packing assembly for a plurality of display modules reducing transportation costs of the display modules by increasing the stacking rate of the display modules. The packaging assembly includes a plurality of seating units for subsequent display modules, where each seating unit is intended for a single display module.

[0011] Another solution known from the patent specification of US application No. US 2008/0314784 presents a lightweight, shock-absorbing package for shipping three-dimensional articles. The case-type package is formed from a flat sheet with relatively stiff front and back faces. The case includes at least one shock-absorbing resilient member made of lightweight, flexible material of sufficient length to flexibly close the three open edges of the case.

[0012] Another known solution is presented in the patent specification of US application No US 2010/0276331, where spring vertical packaging elements having a form of two columns of a spatial closed cardboard section are disclosed. The vertical elements contain horizontal seating units for fixing a horizontal package of a three-dimensional object inside the seating units.

[0013] The invention solves the task of reducing the amount of damage car brake discs during their transportation. A unit for transportation of car brake discs is presented in claim 1 and in preferred embodiments in subsequent patent claims.

[0014] The unit according to the invention comprises a collective packaging in the form of a transport box and comprises cases which are the packages for individual brake discs, intended for fixing in the said transport box. Each case contains at least one member for attaching it inside the transport box. Each case is a flat container of

width, with height and depth corresponding to the dimensions of the brake disc. Inside the transport box there is at least one member for attaching cases.

[0015] The unit according to the invention is characterised in that the front wall of the case which is a package of a brake disc, contains a recess of width and height greater than the dimensions of a sleeve intended for fixing a car wheel rim to a brake disc. One vertical side case wall is tiltably fixed to the case enabling an easy insertion of a disc to the case. However, in at least one of the other side case walls there is at least one seat for fixing the case in the transport box. This seat cooperates with a fastening member inside the transport box.

[0016] In a preferred embodiment, a seating for fixing a case in the transport box is a vertical recess in the upper horizontal case wall.

[0017] In another preferred embodiment according to the invention, the opposite case side wall contains at least two seats for fixing the case in the transport box in the form of one upper seat and one bottom seat. In this embodiment of the case according to the invention, an upper seat for fixing the case in the transport box can be a recess containing at least one working edge extending obliquely from this case side wall upwards, in the direction corresponding to the curvature of the peripheral edge of the brake disc which is inside the case. In this embodiment of the invention, the working edge can be parallel to a line tangent to the edge of the circumference of the brake disc which is inside the case.

[0018] A car brake disc contains, as one of structural elements, a sleeve protruding above the working surface of the disc flange. The sleeve is intended for fixing a car wheel rim. A recess in the case front wall intended for receiving this sleeve can contain a cover with internal dimensions at least equal to external dimensions of the said sleeve. In this preferred embodiment of the invention, the said case cover can contain at least two side walls perpendicular to the surface of the case front wall, parallel to the direction of loading of a brake disc to the case. The cover in this embodiment does not contain side walls, perpendicular to the direction of loading of a brake disc to the case.

[0019] In another embodiment of the solution according to the invention, the side wall of the case cover, perpendicular to the direction of loading of a disc, on the side of loading of a brake disc to the case, can be tiltable.

[0020] According to the invention, the transport box contains a member for fixing cases inside the box. This member, according to the invention, comprises at least one hanger extending inside the transport box, in parallel to its side walls. The transport box is equipped with known opening side walls enabling access to each case containing a disc, placed inside the transport box.

[0021] In a preferred embodiment of the solution according to the present invention, a hanger can comprise a longitudinal section in the form of a channel section whose arms are directed to the base of the transport box. In this solution, on the channel section flange, on the

opposite side of the channel section arms, a longitudinal flat bar perpendicular to the channel section flange can be fixed. In another embodiment of the solution, a hanger can comprise a longitudinal section with a closed cross-section.

[0022] A brake disc during the manufacturing process and/or during transportation to the end user, according to the invention, is packed in a case. A tiltable case arm facilitates the rolling of a disc into the case, and then enables the closing of the case. The disc in the case protected in such a manner is suspended on a hanger in a transport box. The transport box contains two opening side walls and a system of hangers enabling access and removal of any case with a disc, which is inside the box.

[0023] A disc can be removed from a case both without removing the case from the transport box, by tilting a tiltable arm, as well as by removing a case containing a disc from the box and subsequently removing the disc from the case. When a brake disc is unpacked from a case at the final consumer, an empty case is returned for reuse. The sizes of cases and the sizes of transport boxes are tailored to the sizes of the series of types of brake discs.

[0024] The transportation unit according to the invention enables fast loading, unloading and handling of individual cases or boxes with loaded cases in inter-operational transport at the manufacturer, between subsequent cells in the technological process of manufacturing brake discs. At the same time, this solution eliminates the use of expensive single-use packaging. The unit according to the invention at the same time enables random checks of selected discs, providing access to each case with a brake disc loaded into the transport box.

[0025] The basic purpose of the invention has been achieved also by packing each disc into a case, which protects the disc from damage both in inter-operational transportation and in transportation to the end user. The circulation and reuse of individual cases also eliminates waste of single-use packaging used so far.

[0026] The unit according to the invention comprising a transport box eliminates manual handling of discs, which protects workers against health threats in the form of injuries resulting from handling of loads.

[0027] The subject of the invention is presented in the following embodiments in the accompanying drawings, in which various figures illustrate:

- Fig. 1 - a view of a case of the back wall with the tilted side wall,
- Fig. 2 - a view of a case according to Fig. 1 of the front wall,
- Fig. 3 - a view of a case according to Fig. 1 during loading of a disc,
- Fig. 4 - a view of a case according to Fig. 1 after loading of a disc,
- Fig. 5 - a view of a loaded case according to Fig. 1,
- Fig. 6 - a view of an empty case according to Fig. 1 after removing the upper side wall,

- Fig. 7 - a view of a case with a sleeve cover during loading of a disc,
- Fig. 8 - a view of a case according to Fig. 7 after loading of a disc,
- Fig. 9 - a view of a closed case according to Fig. 8,
- Fig. 10 - a view of an empty case according to Fig. 9 after removing the upper side wall,
- Fig. 11 - a view of a case of the back wall with the tilted side wall in the second embodiment,
- Fig. 12 - a view of a case according to Fig. 11 of the front wall,
- Fig. 13 - a view of a case according to Fig. 11 during loading of a disc,
- Fig. 14 - a view of a case according to Fig. 11 after loading of a disc,
- Fig. 15 - a view of a closed case according to Fig. 14,
- Fig. 16 - a view of two hangers with cases hung on them in the second embodiment,
- Fig. 17 - a view of two hangers with cases hung on them in the fourth embodiment,
- Fig. 18 - a front view of the interior of a transport box with cases in the first or second embodiment after removing the front wall,
- Fig. 19 - a top view of a transport box interior according to Fig. 18 after removing the upper wall,
- Fig. 20 - a front view of the transport box interior in the third or fourth embodiment after removing the front wall,
- Fig. 21 - a top view of the transport box interior according to Fig. 20 after removing the upper wall

[0028] The unit for transportation of car brake discs in the first embodiment is shown in Figures from 1 to 6. The unit according to the invention comprises a collective packaging in the form of a transport box 1. The transport box is shown in Fig. 18 and Fig. 19 together with cases according to the second embodiment.

[0029] The unit comprises cases 2 comprising unit packages for individual car brake discs. The cases 2 are intended for fixing in the transport box 1. The cases are made of metals or plastics.

[0030] In the first embodiment a case 2.1 is a flat container with width, height and depth corresponding to the dimensions of a brake disc 3. This is shown in Figures from 1 to 6. The front wall 4 of the case 2.1 comprising a unit package of the brake disc 3 has a recess 5. The recess 5 has width, height and depth greater than the dimensions of a sleeve 6 intended for fixing a car wheel rim to the brake disc 3. A vertical side wall 7 of the case 2.1 is tiltably attached to the case 2 on two axes of rotation 8. The tiltable side wall 7 after closing by a quarter turn, connects with the case in the known latching system, which is not shown in the accompanying figures.

[0031] However, in this embodiment in the upper horizontal side wall 9 of the case 2.1 there is a seat for fixing the case 2 in the transport box 1. This seat cooperates with a fastening member inside the transport box 1.

[0032] Fig. 6 shows two axes of rotation 8 on which the tiltable vertical side wall 7 is fixed to the case. Such a solution facilitates the rolling of the disc 3 into the case. This applies to all embodiments of the case 2.1, 2.2, 2.3, 2.4.

[0033] In the first embodiment shown in Figures from 1 to 5, a seat for fixing a case 2.1 in the transport box 1 is a vertical recess 10 in the form of a cut in the upper horizontal wall 9 of the case 2.1.

[0034] In the second embodiment of the case a recess in the case 2.2 front wall 5 is covered by a cover 11. The cover 11 has a free space inside corresponding to the dimensions of the sleeve 6 of the brake disc 3. Thus, the cover 11 also protects the sleeve 6 against damage during transportation. As shown in Fig. 7 and Fig. 8, the cover 11 in this embodiment has a tiltable side wall 12, on the side of loading of the brake disc 3 to the case 2.2. Other embodiments do not exclude that the cover 11 does not comprise the side wall 12, or comprises only two side walls, upper and bottom, parallel to the direction of loading of the brake disc 3 to the case 2.2. A loaded and closed case 2.2 with the cover 12 with four side walls is shown in this embodiment in Fig. 9. An empty case 2.2 in this embodiment in a view after removing the upper horizontal side wall 9 is shown in Fig. 10.

[0035] In the third embodiment of the case according to the invention, in the case 2.3 opposite side wall 14 there are two seats for fixing the case 2.3 in the transport box 1, one upper seat and one bottom seat. As shown in Figures from 11 to 15, the upper seat for fixing the case in the transport box is an upper recess 15. The recess 15 comprises a working edge 16 extending obliquely to the opposite side wall 14 of the case 2.3 upwards, in a direction parallel to a tangent to the curvature of a peripheral edge 17 of the brake disc 3 which is inside the case 2.3. This is shown in Fig. 14 and Fig. 15. In this variant of the invention, in another embodiment, the working edge 16 can also extend in a direction not parallel to a line tangent to the peripheral edge 17 of the brake disc 3 which is inside the case 2.3.

[0036] The fourth embodiment is also presented in the form of a case 2.4, which contains a cover 11 on the front wall, as shown in the embodiment in Fig. 8 and Fig. 9 in the case of the case 2.2 shown as the second embodiment of the case.

[0037] As shown in Figures from 18 to 21, the transport box 1 comprises members for fixing cases inside the box. As shown in the embodiment in Fig. 18 and 19, in the transport box 1 there are two longitudinal members in the form of hangers 18. In this embodiment, the box 1 cooperates with cases 2.2 according to the second embodiment, but the same hangers cooperate with the first type of cases 2.1. These hangers extend inside the transport box 1, in its axis of symmetry parallel to the side walls 20 of the transport box 1.

[0038] The cases 2.2 fixed on hangers 18 are shown in Fig. 16. The hanger 18 in this embodiment comprises a longitudinal section in the form of a channel section

whose arms 21 are directed to the transport box base. In this embodiment, on a channel section flange 22, on the opposite side of channel section arms 21, a longitudinal flat bar 23 perpendicular to the flange 22 is fixed. Fig. 16 shows that it is possible to further expand the system of hangers by adding additional hangers from the top and/ or from the bottom.

[0039] The transport box 1 for cooperation with cases 2.1 and 2.2 is shown after removing the front wall in Fig. 18 and after removing the upper wall in Fig. 19.

[0040] In another embodiment, shown in Fig. 17, a hanger comprises two longitudinal sections 24 with a closed cross-section. In this embodiment, they comprise pipe sections. This type of hangers has been developed for cooperation with cases 2.3 and 2.4. Fig. 17 shows that it is possible to further expand the system of hangers by adding another pair of hangers from the bottom or from the top.

[0041] The transport box 1 for cooperation with cases 2.3 and 2.4 is shown after removing the front wall in Fig. 20 and after removing the upper wall in Fig. 21.

[0042] As shown in Fig. 19 and Fig. 21, in these embodiments, each layer of the transport box 1 contains two rows of cases 2.2 and 2.4, but the transport box 1 cooperates in a similar way with cases 2.1 and 2.3, according to the other embodiments of cases described above. With the transport box side walls 20 opening in the known manner, which is not shown in the accompanying figures, the solution according to the invention enables access to each case 2.1,2.2,2.3,2.4 situated in the transport box 1 containing a brake disc 3 inside anytime.

The list of designations in the drawings

[0043]

1. Transport box.
- 2.1. Case.
- 2.2. Case.
- 2.3. Case.
- 2.4. Case.
3. Brake disc.
4. Front wall of the case.
5. Recess in the front wall.
6. Sleeve.
7. Tilttable vertical side wall of the case.
8. Axis of rotation.

9. Upper horizontal side wall of the case.
10. Vertical recess.
11. Cover.
12. Tilttable side wall of the cover.
13. Back wall of the case.
14. Opposite side wall of the case.
15. Upper recess.
16. Working edge of the upper recess.
17. Peripheral edge of the brake disc.
18. Hanger.
19. Bottom recess.
20. Side wall of the transport box.
21. Channel section arm.
22. Channel section flange.
23. Longitudinal flat bar.
24. Section with a closed cross-section.

Claims

1. Unit for transportation of car brake discs comprising a collective packaging in the form of a transport box and comprising cases which are packages for individual brake discs, wherein each case contains at least one member for attaching it inside the transport box and is a flat container of width, height and depth corresponding to the dimensions of the car brake disc, and inside the transport box there is at least one member for attaching cases, **characterised in that** the front wall (4) of the case (2.1,2.2,2.3,2.4) contains a recess (5) of width and height greater than the dimensions of a sleeve (6) of a brake disc (3), and one vertical side wall (7) of the case (2.1,2.2,2.3,2.4) is tilttable attached to the case, wherein in at least one of the other side case walls there is at least one seating unit for fixing the case (2.1,2.2,2.3,2.4) in the transport box (1).
2. Unit, according to claim 1, **characterised in that** the seating unit for fixing the case (2.1, 2.2) in the transport box (1) is a vertical recess (10) in the upper horizontal wall (9) of the case (2.1, 2.2).

3. Unit, according to claim 1, **characterised in that** in the opposite side wall (14) of the case (2.3, 2.4) there are at least two seating units for fixing the case (2.3, 2.4) in the transport box (1), one upper seating unit and one bottom seating unit. 5

4. Unit, according to claim 3, **characterised in that** the upper seating unit for fixing the case (2.3, 2.4) in the transport box (1) is an upper recess (15) containing at least one working edge (16) extending diagonally from the case side wall (14) upwards, in the direction of the curvature of the peripheral edge (17) of the brake disc (3) which is inside the case (2.3, 2.4), and the bottom seating unit is a bottom recess (19). 10
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5. Unit, according to claim 4, **characterised in that** the working edge (16) of the upper recess (15) extends parallel to the line tangent to the peripheral edge (17) of the brake disc (3) which is inside the case (2.3, 2.4). 20

6. Unit, according to claim 1, **characterised in that** a recess (5) in the front wall (4) of the case (2.1,2.2,2.3,2.4) comprises a cover (11) with internal dimensions at least equal to the dimensions of the brake disc (3) sleeve (6). 25

7. Unit, according to claim 6, **characterised in that** the case (2.2,2.4) cover (11) comprises at least two side walls perpendicular to the surface of the front wall (4) of the case, parallel to the direction of loading of a brake disc (3) to the case. 30

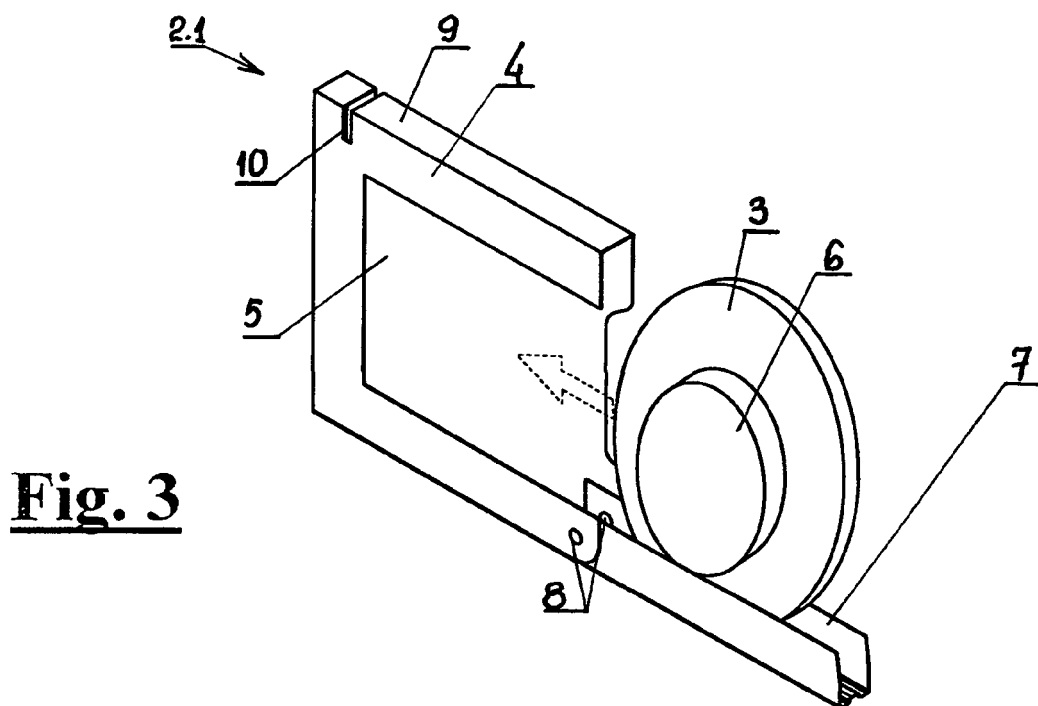
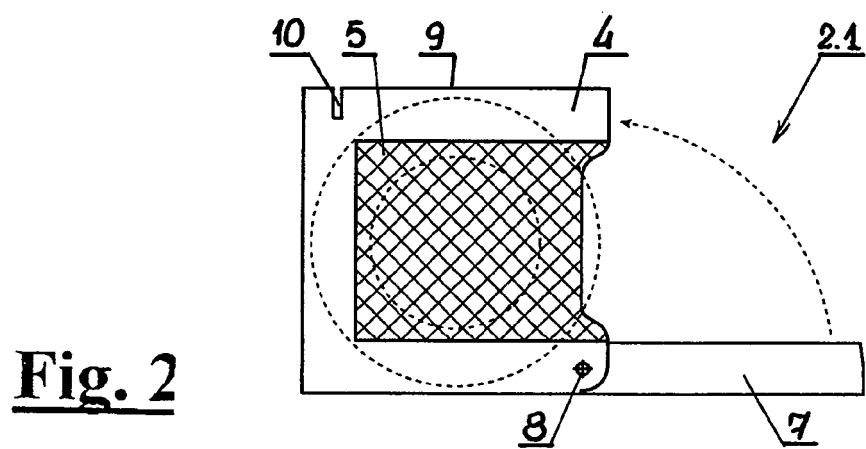
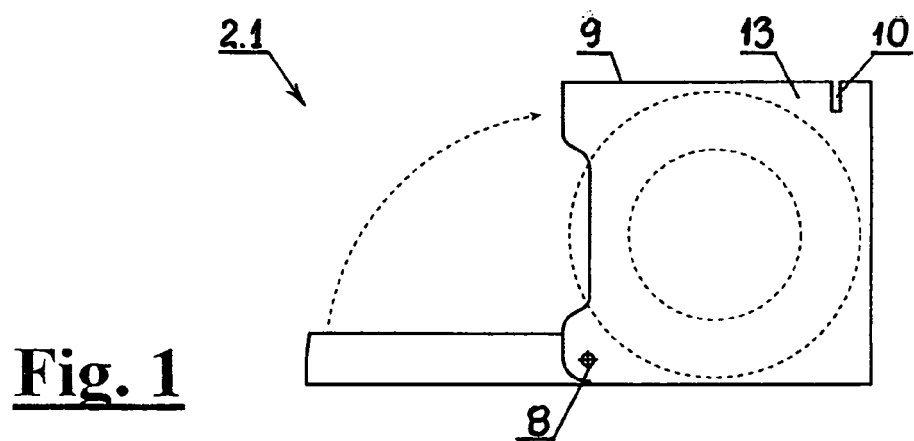
8. Unit, according to claim 6, **characterised in that** the side wall (12) of the case (2.2,2.4) cover (11), perpendicular to the case front wall (4) on the side of loading of a brake disc (3) to the case, is tiltable. 35

9. Unit, according to claim 1, **characterised in that** a member for fixing cases (2.1,2.2,2.3,2.4) in the transport box (1) is at least one hanger (18) extending inside the transport box (1) parallel to side walls (20) of the transport box (1). 40

10. Unit, according to claim 9, **characterised in that** the hanger (18) is a longitudinal section in the form of a channel section whose arms (21) are directed to the transport box (1) base. 45

11. Unit, according to claim 10, **characterised in that** on the channel section flange (22), on the opposite side of channel section arms (21), a longitudinal flat bar (23) perpendicular to the channel section flange (22) is fixed. 50
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12. Unit, according to claim 9, **characterised in that** the hanger (18) is a longitudinal section (24) with a closed cross-section.



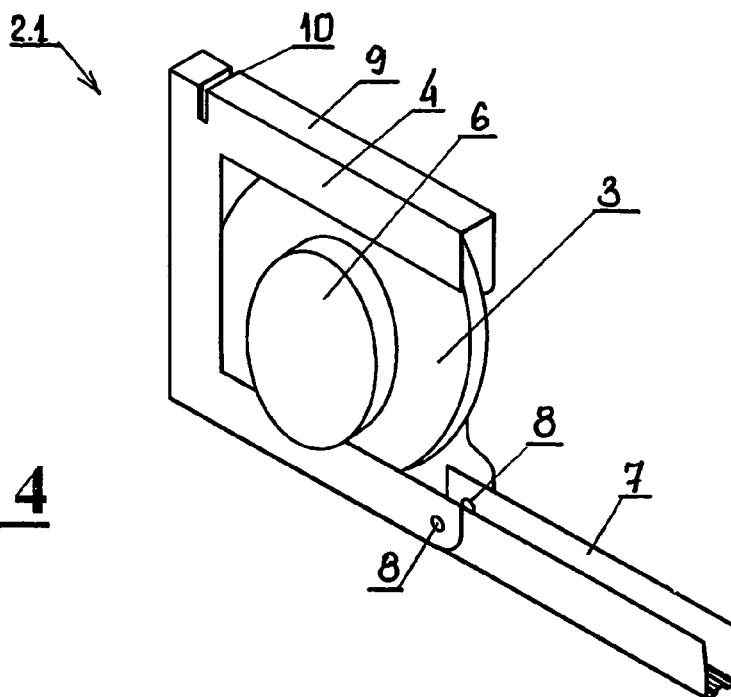


Fig. 4

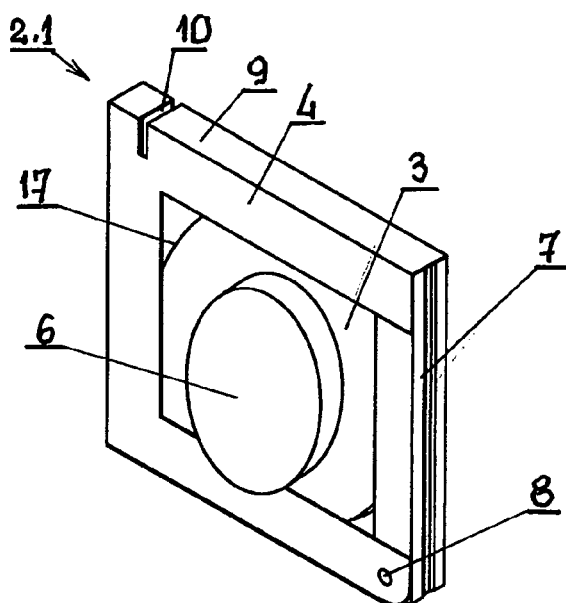


Fig. 5

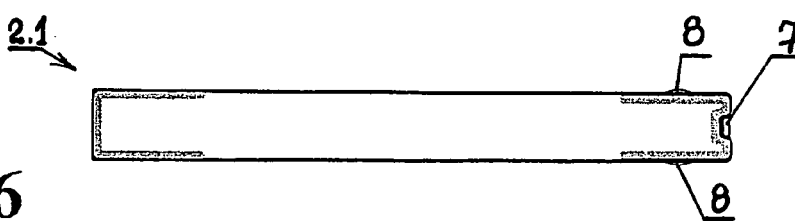
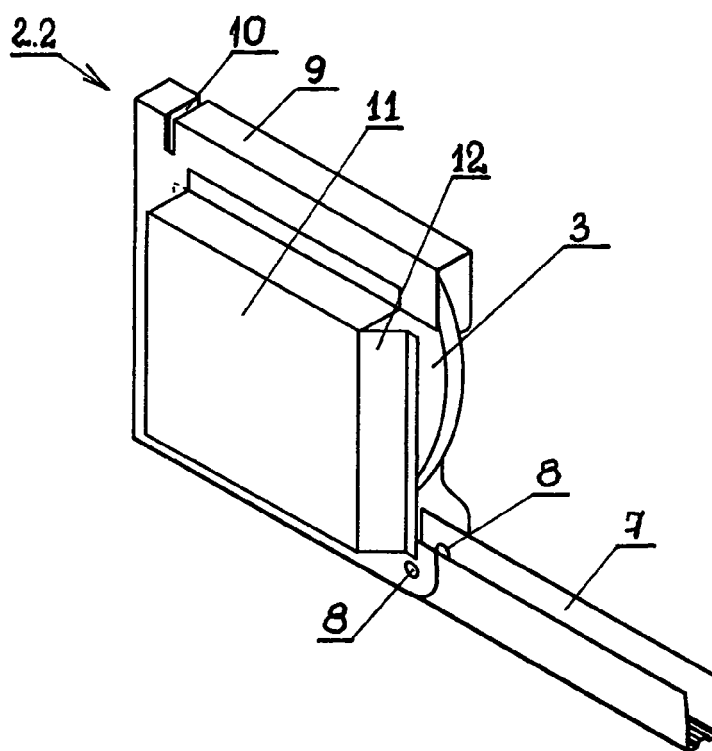
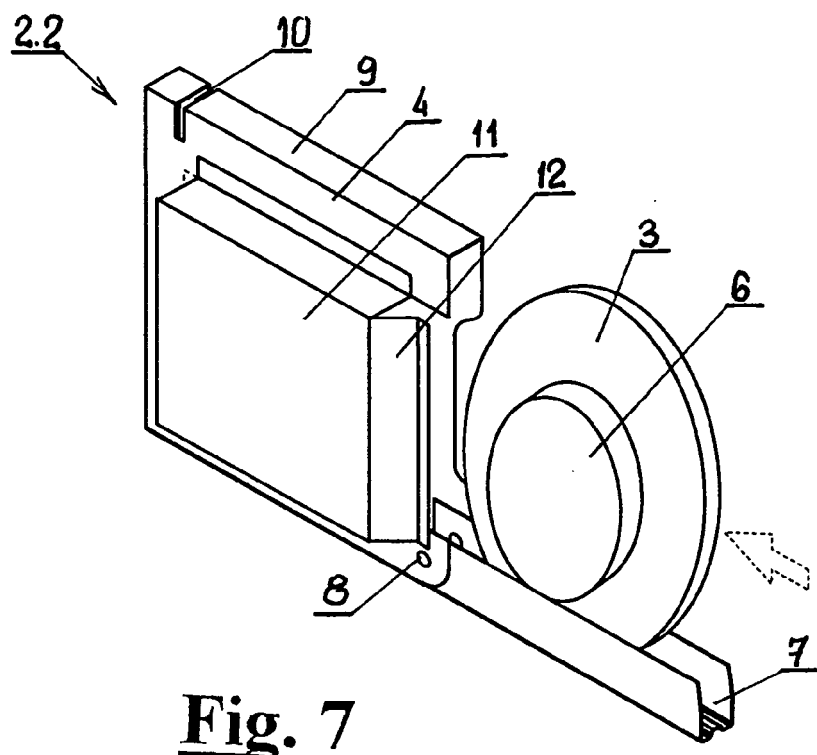


Fig. 6



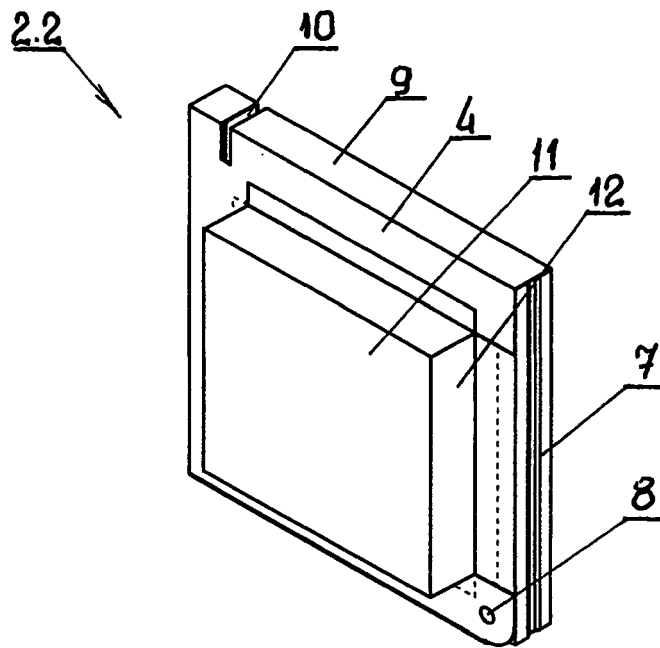


Fig. 9

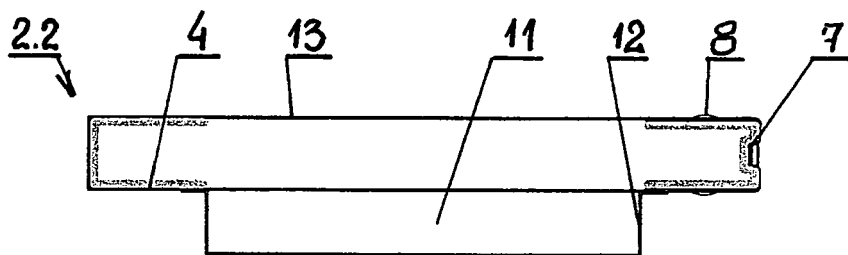


Fig. 10

Fig. 11

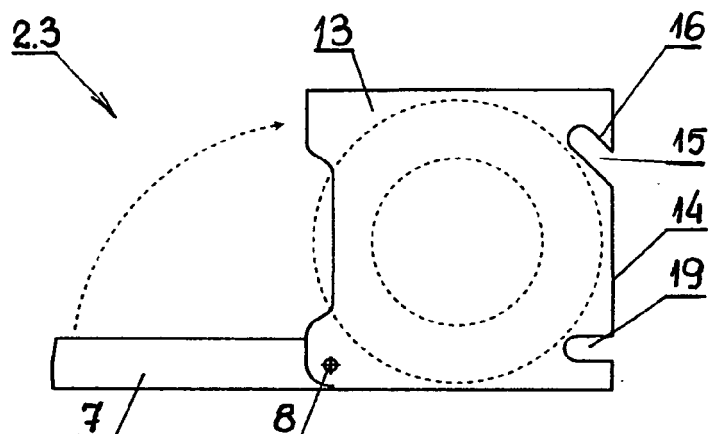


Fig. 12

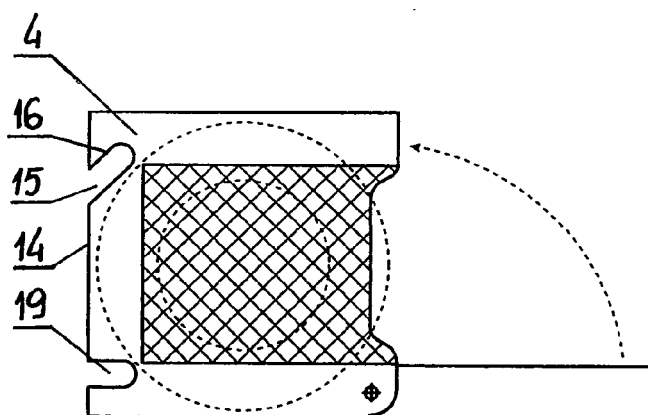
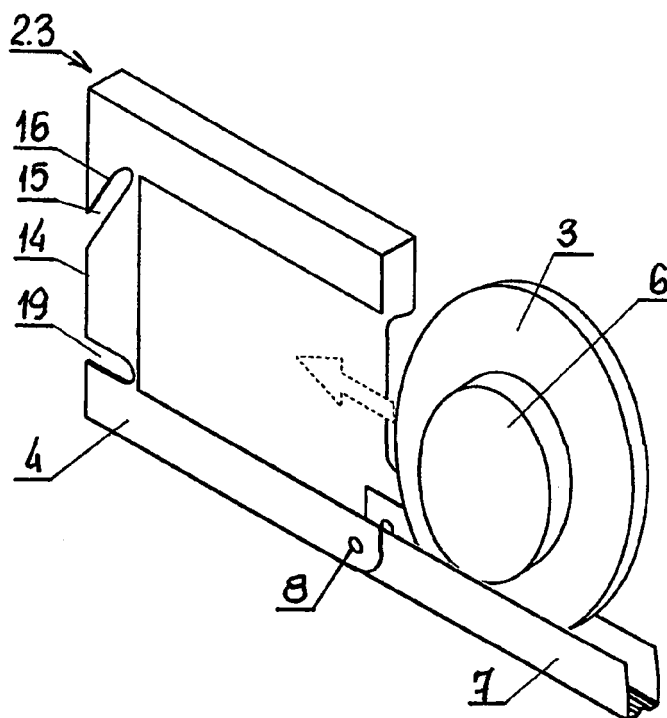


Fig. 13



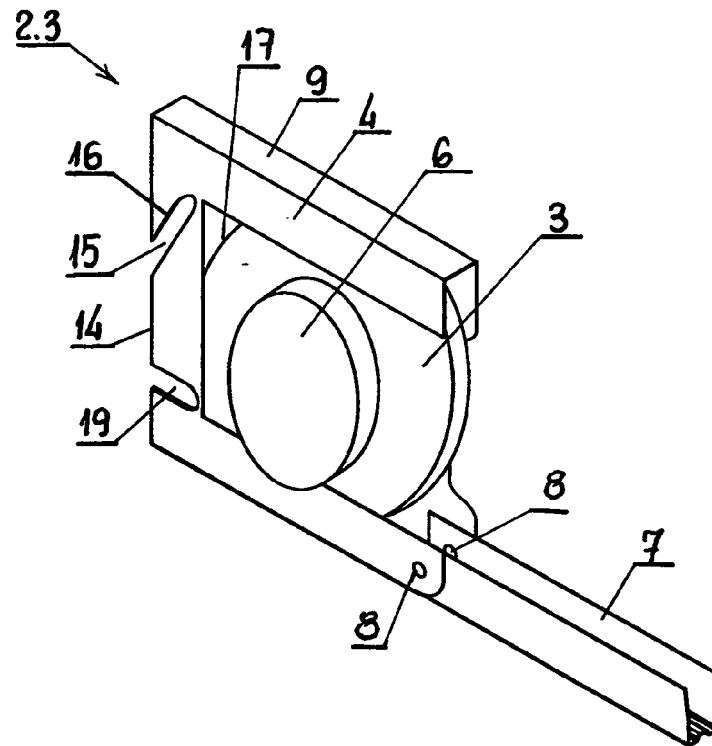


Fig. 14

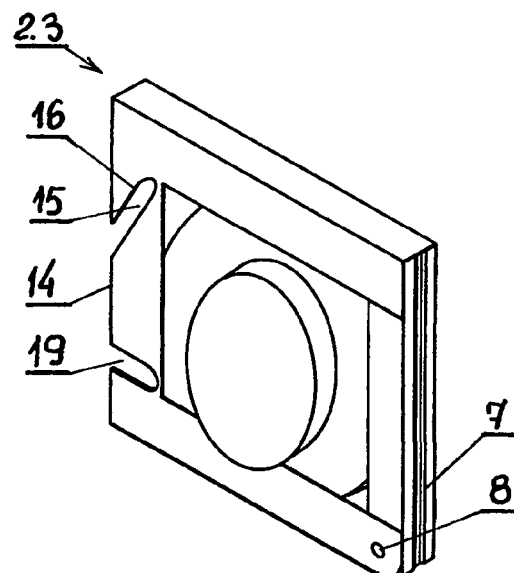


Fig. 15

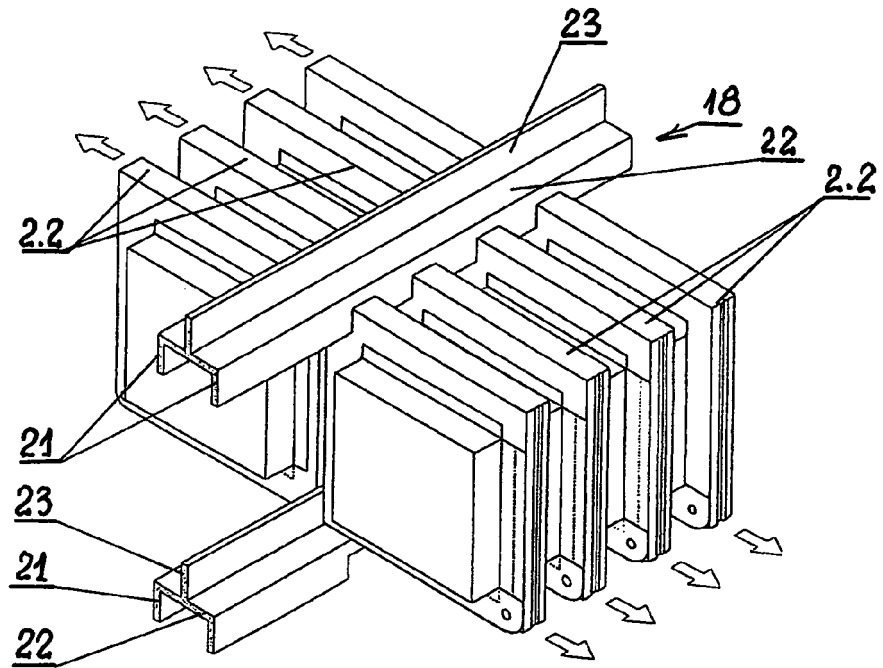


Fig. 16

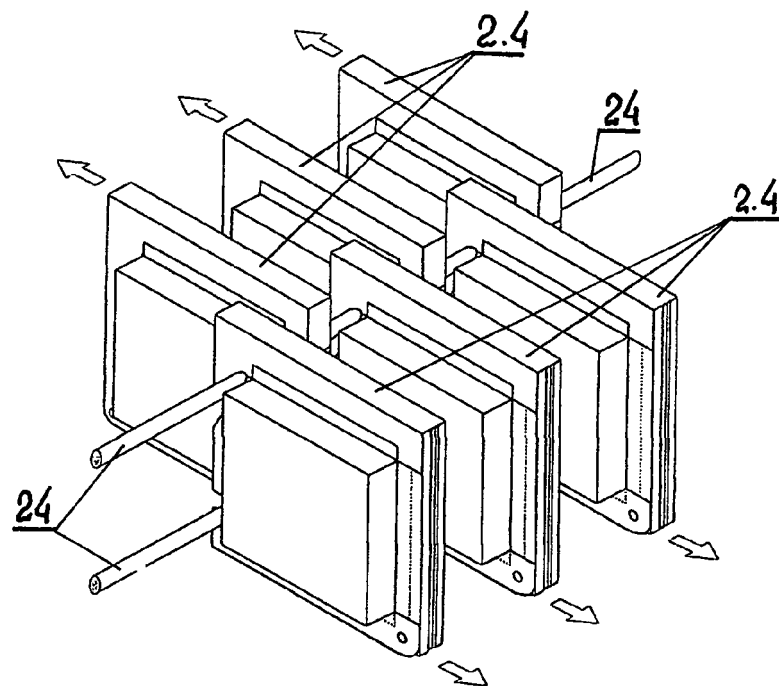


Fig. 17

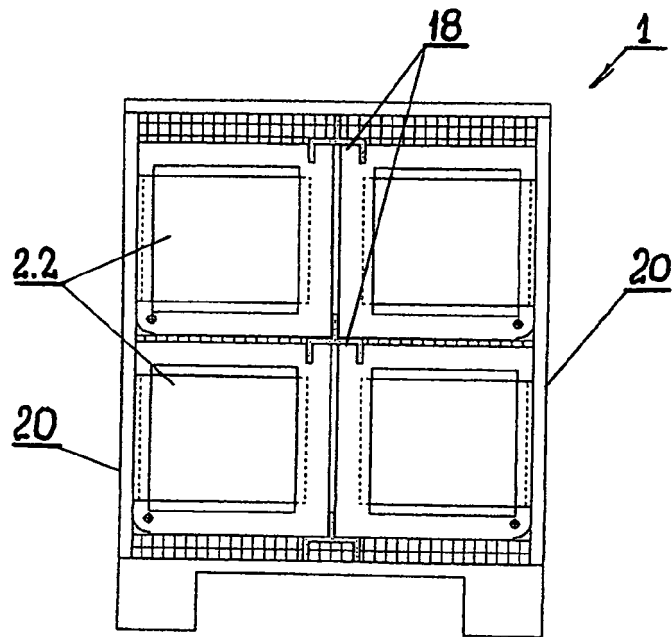


Fig. 18

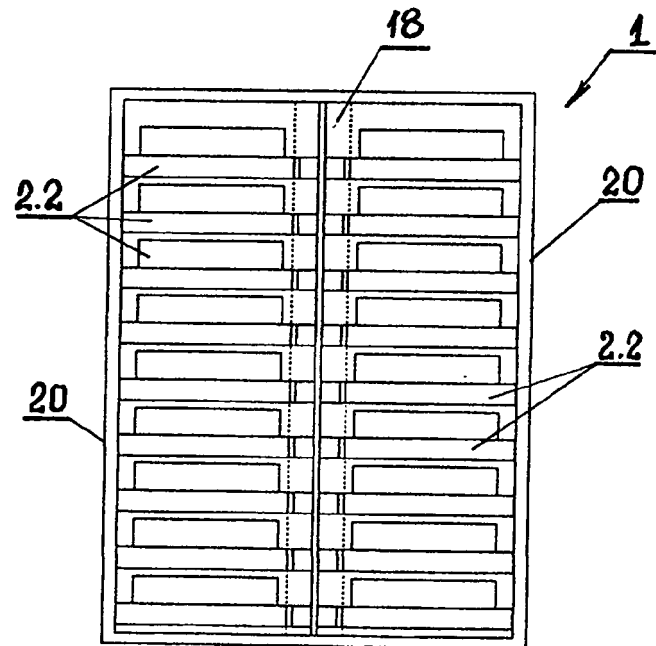


Fig. 19

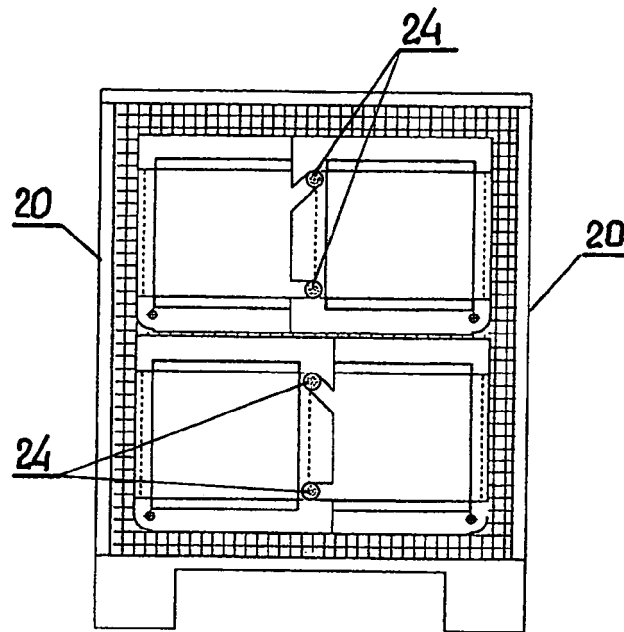


Fig. 20

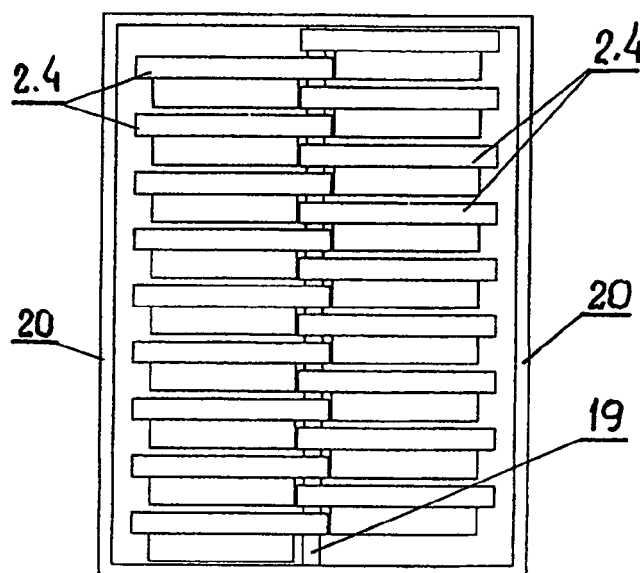


Fig. 21



EUROPEAN SEARCH REPORT

Application Number
EP 12 46 0057

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2010/041023 A1 (PROTECTIVE PACKAGING SYSTEMS L [GB]; PITT JEFFREY GRAHAM [GB]) 15 April 2010 (2010-04-15) * page 3, line 1 - page 6, line 15; figures 1-10 * -----	1	INV. B65D81/05 B65D85/58
			TECHNICAL FIELDS SEARCHED (IPC) B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 January 2013	Examiner Cazacu, Corneliu
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