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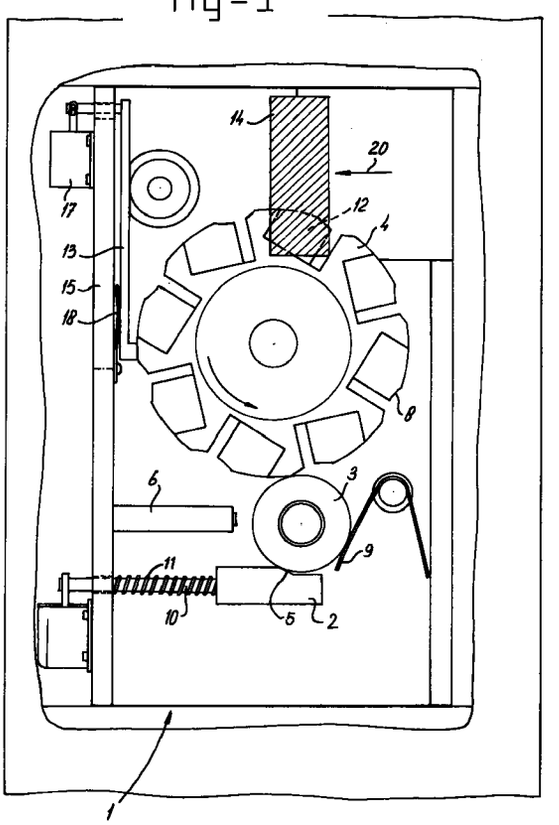
(54) Locking device

(57) Locking device, comprising a wedge member (2), a locking member which engages thereon and a contacting membe (4,25) The contacting member is engaged by the part to be locked. According to the invention, the contacting member (4,25) is rotatably constructed. In the execution of such a rotation, the locking member (3) is displaced. This displacement can either occur for the purpose of wedging the locking member (3) on the clamping surface of the wedge member (2) or for the purpose of releasing it. A locking device of this kind has the distinguishing feature that it locks without play. The contacting member (4,25) can either be a rotating wheel (4) or a pawl (25) which moves to and fro. The locking member (3) is preferably constructed as a roller and in the contacting member (4,25) there is fitted a correspondingly shaped clamping surface. The locking member (3) is arrested, during the wedging movement, against a stop.

fig-1



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Description

The present invention relates to a locking device comprising a rotatable contacting member provided with means for engaging with the part to be locked, provided with a circumferential surface comprising an inclined part for clamping engagement with a latching system, which latching system comprises a translatable wedge member having at least one inclined wedge surface.

In the prior art, a large number of locking devices are represented, for example for locks. There are generally two problems with these. The first problem is that the force which is applied in the attempt to revoke the locking is transmitted to the actual locking device. This means that the locking device must be particularly heavily constructed, which has negative consequences for the control device. A control device of this kind is present in order to undo the locking and, in the case of the devices known in the prior art, whenever a force is applied to revoke the locking, a force is also applied to the control means, thereby making the operation thereof more difficult. The movable closing cup in certain locks is here cited as an example. In order to be able to operate such locks without moving the bolt, it is usual in the case of the remote-control locks to have part of the closing cup tilt away, enabling the bolt to be moved freely out of the cup. If attempts are made to remove the bolt with force in the locked state, this means that the force has to be applied to the tiltable part of the cup, thereby requiring the latter to be heavily constructed. Moreover, measures have to be taken to prevent, on the one hand, the possibility of unauthorized opening and, on the other hand, in the case of remote-control operation, the possibility of opening being effected in a simple manner. This means that a relatively large force is necessary to eliminate the locking, which has the associated effect that a relatively heavy servomotor is necessary. This is particularly disadvantageous in cases where batteries and the like are used. Moreover, there is the drawback with such locks that if, prior to the remote-control operation, a movement is applied to the bolt for the purpose of releasing the locking, the movable part of the cup is scarcely able to be operated, so that the remote-control operation fails and the person positioned by the door has to be asked to delay the use of the door until the remote-control operation has been realized.

The second problem which is associated with locking devices is that movement past a latching point is often necessary to realize the latching, after which the locked part is able, to some extent, to be moved back again, i.e. the locked part is locked with some degree of play. It is thereby necessary with doors, for example, to fit weather strips and other resilient parts to prevent the door from rattling. Quite apart from the unpleasantness of such a noise, it has also been shown that such changing loads eventually cause damage either to the bolt or the cup.

From American patent specification 2919152, a locking device according to the preamble of Claim 1 is known. In this, a contacting member engages with its tooth-like projections on a wedge member which is fitted such that it is linearly displaceable along a guide. Although, with a device of this kind, an optimal clamping force can be realized, the problem exists that it is particularly difficult to effect opening of a door or frame, for example, against a substantial force, such as, for example, of a weather strip or safety device. It is thereby necessary to design the control device for the wedge member in heavy construction.

The object of the present invention is to provide a locking device which does not have these drawbacks, i.e. on the one hand, following the latching, no longer displays any return movement, and in which, on the other hand, the control means are not subjected to the locking force, so that simpler operation is possible.

This object is realized in an above-described locking device by the fact that the latching system comprises a revolving body fitted between the wedge member and the contacting member and that the contacting member is provided with at least one receiving fixture for the revolving member.

The invention is based upon the idea of fitting a revolving member between the wedge member and the contacting member. Moreover, this revolving member is confined in special recesses made in the contacting member.

Even if considerable force is applied, for unlocking purposes, to the contacting member, it is possible to displace the wedge member with relatively little force in order, in this way, to take care of the unlatching.

It is noted that, from American patent specification 2864636, a construction is known in which a revolving member is used. This revolving member provides for a wedging effect. In contrast to what has been described above, this is supported, on the one hand, on a solid surface and, on the other hand, on an auxiliary rod, which, in a complex manner, operates the contacting member.

The invention is based upon the idea of executing a wedging movement with the aid of a locking member placed between a clamping surface of the contacting member and a wedge surface. Such a wedging movement can be realized without significant play, whilst it is possible, on the other hand, to undo the wedging effect in a particularly simple manner. By operating the wedge member, the locking can be revoked. Because of the presence of the wedge surface, the operation of this wedge member occurs in a direction which is different from the direction in which the forces are acting when attempting to undo the locking, i.e. the control mechanism requires relatively little force and can be lightly constructed, thereby enabling the system, in the case of electrical (remote) control, to be constructed substantially more simply. This means that, in the case of the above-stated locks, a battery may be adequate.

According to an advantageous embodiment of the

invention, the locking member comprises a locking roller and the clamping surface a recess conforming to the shape of the roller. Through rotation of the clamping member, the roller is moved to and fro and engages with or disengages from the wedge surface. Upon disengagement, the contacting member is able, of course, to move freely. Upon engagement with the wedge surface, the locking roller is clamped between the clamping surface of the contacting member and the wedge surface of the wedge member, thereby enabling the prevention of any further rotation of the contacting member. This effect can be further enhanced if there is a stop present which limits the movement of the locking member for the purpose of the locking. This serves to ensure, on the one hand, that sufficient wedging action of the locking member is obtained and, on the other hand, that simple operation of the wedge member is possible in order to move the wedge surface away from the locking member. According to a further advantageous embodiment, means, such as springs, are present to drive the locking member into the locking state. The wedge member is preferably displaceably fitted. By use of the control means, the wedge member can be disengaged from the locking member. The direction of the displacement, the angle of inclination of the wedge surface and the shape of the locking member are, of course, mutually coordinated in such a way that, when the wedge surface is wedged by the locking member, the wedge member cannot be displaced.

The control means for the unlatching of the wedge member, i.e. the movement of the wedge member out of the motional path of the locking member, can additionally comprise means for driving the wedge member into the motional path of the locking member. A positive movement is thereby taken care of, i.e. only when the control means are operated is the locking released.

According to a further advantageous embodiment, the contacting member is provided with means for receiving the part to be locked. This can be a receiving fixture which is matched to the shape of the part to be received, such as a bolt. The contacting member can either be constructed as a continuously rotatable wheel, and has in this case a plurality of means for the part to be locked, or can be constructed as a pawl which can be moved to and fro. In this case, only one receiving fixture is present. An example of the latter construction as used in locks is constituted by vehicle locks.

According to a further advantageous embodiment, further locking means can be present in order to lock the contacting member in a direction opposite to the locking direction of the locking device just described, i.e. with such further locking means it becomes possible to secure a part to be locked in two directions.

The above-described locking device is particularly suitable for use in locks. Naturally, the invention is not confined thereto and can be used for all other locking devices employed in the prior art.

In the locking state, the revolving member or the roller or ball can be located against an inclined surface or can be displaced across this and rest on a surface without inclination. The latter construction requires a high level of working precision with regard to the height-coordination of the recess of the contacting member, the diameter of the roller and the "thickness" of the wedge member, but, on the other hand, makes a less critical operation of the wedge member possible.

In order to make the construction as light as possible, it is preferable to fit a frame which houses the components which are subjected to load, i.e. at least the contacting member and wedge member are received in such a frame, which needs to be relatively heavily constructed, whilst the other part of a locking device or lock can be relatively lightly constructed.

The invention shall be further explained below with reference to two illustrative embodiments represented in the appended drawings, in which:

- Fig. 1 shows an exploded view of a cup construction for a door lock upon inward movement of the bolt;
- Fig. 2 shows the device according to Fig. 1 in the locked state of the bolt;
- Fig. 3 shows the construction according to Figs. 1 and 2, but with the bolt having been released and moving outward,
- Fig. 4 shows a perspective view of the device according to Figs. 1-3 in exploded state;
- Fig. 5 shows a further embodiment of the invention in the latched state; and
- Fig. 6 shows the embodiment according to Fig. 5 in the unlatched state.

In Figs. 1-3, a first preferred embodiment of the locking device according to the invention is denoted in its entirety by 1. This locking device comprises a wedge part 2, a locking roller 3 and a contacting wheel 4. The wedge part 2 is provided with a wedge surface 5. A housing 15 of the locking device houses a stop 6. The contacting wheel 4 is provided with a circular-arc-shaped recess 8, the shape of which conforms to the outer circumference of the locking roller 3. Likewise, a number of receiving fixtures 12 are fitted for the reception of a bolt 14 of a lock (not depicted in greater detail). 10 denotes a control rod for the wedge part 2, which is connected to a spool 16. Likewise, a spring 11 is fitted in order to drive the wedge part 2, when the spool 16 is not activated, into the position depicted in Fig. 1. A locking arm 13 is present, which is operated with the aid of the spool 17 and is driven by means of a spring 18 into the receiving fixture 12 for the bolt.

The above-described device functions as follows:

In the position depicted in Fig. 1, the spool 17 is operated for the purpose of deactivating the locking arm 13, i.e. the contacting wheel 4 is able to rotate freely to the left. The spool 16 is not operated. When a bolt moves in the direction of the arrow 20 in Fig. 1, it will rotate the contacting wheel 4 to the left. As has been described above, such rotation to the left is not impeded

by the released locking arm 13 and, in the event of this leftward rotation, the locking roller 3 will be moved against the spring 9. Upon such a movement, the locking roller 3 rolls along the wedge surface 5. Subsequently, the bolt 14 enters into the position depicted in Fig. 2. Further movement is prevented by the locking arm 13 falling into a receiving fixture 12. Whilst the bolt 14 is in motion, operation of the spool 17 is unnecessary, since the locking arm 13 is moving along the circumference of the contacting wheel 4. In the position illustrated in Fig. 2, movement of the contacting wheel to the right, i.e. the unlatching of the bolt 14, is precluded by the locking device according to the invention. Indeed, when the contacting wheel 4 moves to the right, the locking roller 3, which by now, through the presence of the following recess 8, has moved back, under the influence of the spring 9, into the position depicted in Fig. 2, will be pressed downward and to the left. Movement to the left is only possible to a limited degree through the presence of the stop 6. Downward movement is impeded by the wedge surface 5. This force is absorbed by the roller 19, which supports the wedge piece 2. This force does not act upon the control rod 10 of the wedge part 2.

If unlatching is subsequently required, the spool 16 has to be operated, whereby the control rod 10 moves to the left in Fig. 3. Where such a movement is induced by the spool 16, it is immaterial whether or not a force is applied to the locking roller 13 for the purpose of releasing the bolt 14. This means that the spool 16 can be relatively lightly constructed. In this case, it is not necessary to operate the spool 17 by means of the cam surface along which it moves. The locking arm 13 works solely for the purpose of impeding the leftward rotation of the contacting wheel 2.

The bolt which is depicted here can be a bolt of either a revolving door or a sliding door. In Fig. 4, all this is illustrated in greater detail in perspective view. In this figure, a supporting frame 50 is indicated likewise in dashed representation. In this, the contacting wheel 4 is rotatably mounted and the wedge 2 displaceably mounted and the roller 3 is confined therebetween. It is only these components which need to be relatively solidly constructed, whilst the other parts of the device according to the invention can be relatively lightly constructed.

Figs. 5 and 6 depict a further embodiment of the invention. In this, the contacting member is constructed as a pawl 25. The bolt is here a pin, denoted by 24. In the above-described manner, it is possible to move the pawl 25 between two positions. In this case, no locking arm 13 is present, which, in most cases, will also not be necessary. The construction shown in Figs. 5 and 6 is particularly suitable for vehicle locks. The supporting roller 19 is present to optimize the displacement of the wedge part 2 and likewise to be able to absorb forces, applied by the locking roller 3, in the vertical direction.

Although the invention has been described above with reference to a preferred embodiment, it should be understood that numerous modifications can be made to it without passing beyond the scope of the present application. Thus, it is possible to use the above-described locking device for other objectives and to construct it accordingly. Likewise, it is also possible to introduce modifications into the construction which is here shown. Thus, the locking roller can be constructed as a locking ball or other locking part. In addition, it is possible to construct the inclined surface 5 such that it is of such a length and rises so substantially that the roller 3 never passes the ends thereof.

Claims

1. Locking device (1) comprising a rotatable contacting member (4, 25) provided with means for engaging with the part to be locked, provided with a circumferential surface comprising an inclined part for clamping engagement with a latching system (2, 3), which latching system comprises a translatable wedge member (2) having at least one inclined wedge surface, characterized in that the latching system comprises a revolving body (3) fitted between the wedge member and the contacting member (8) and in that the contacting member is provided with at least one receiving fixture for the revolving member.

2. Locking device according to Claim 1, in which the revolving member is a locking roller (3) and the circumferential surface of the contacting member comprises a recess (8) conforming to part of the shape of the roller.

3. Locking device according to one of the preceding claims, in which means (9) are present to drive the revolving member into the locking state.

4. Locking device according to one of the preceding claims, in which the wedge member is provided for the unlatching of control means.

5. Locking device according to one of the preceding claims, in which the contacting member is provided on the side opposite the clamping surface with means (12) for the part to be locked.

6. Locking device according to one of the preceding claims, in which the contacting member is a wheel (4) and is provided with a plurality of means (12) for the part (14) to be locked.

7. Locking device according to one of Claims 1-5, in which the contacting member is a pawl (25).

8. Locking device according to one of the preceding claims, in which further locking means (13) are present to lock the contacting member in a direction opposite to that according to one of the preceding

claims.

9. Locking device according to one of the preceding claims, comprising a frame (50) in which the wedge member and the contacting member are displaceably fastened.

10. Locking device according to one of the preceding claims, in which the wedge member is provided with supporting means (19).

fig-1

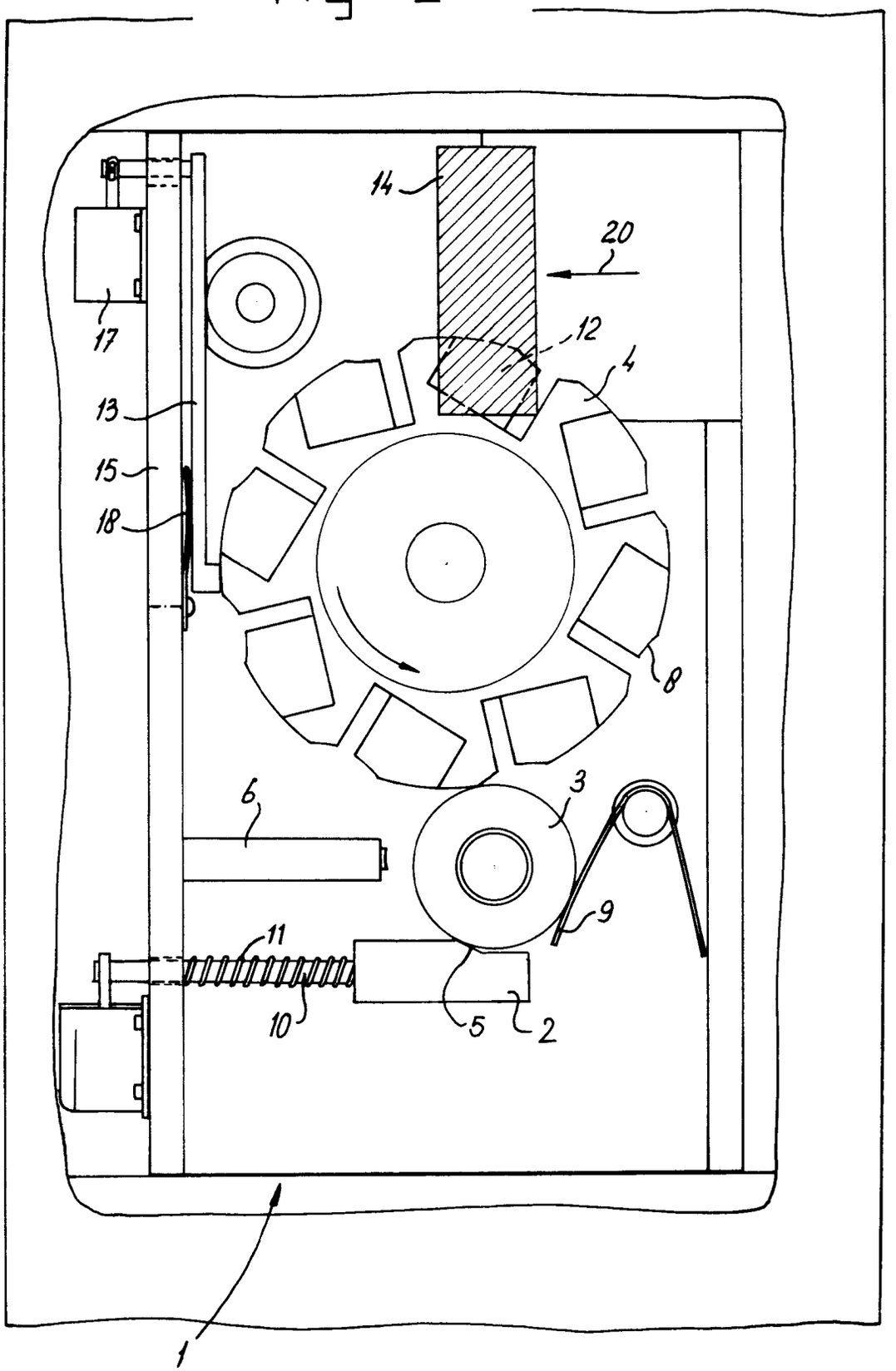


fig-2

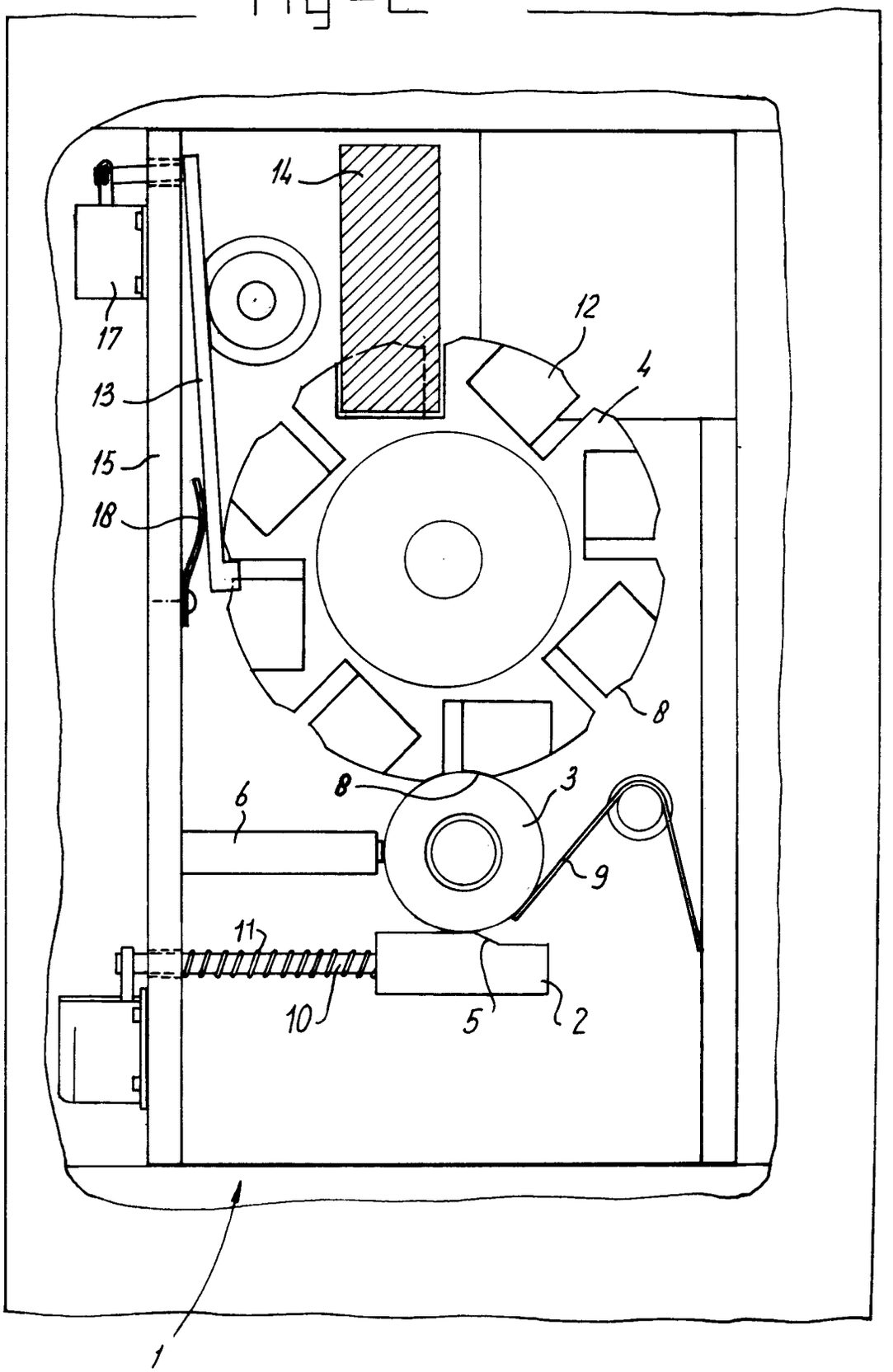


Fig-3

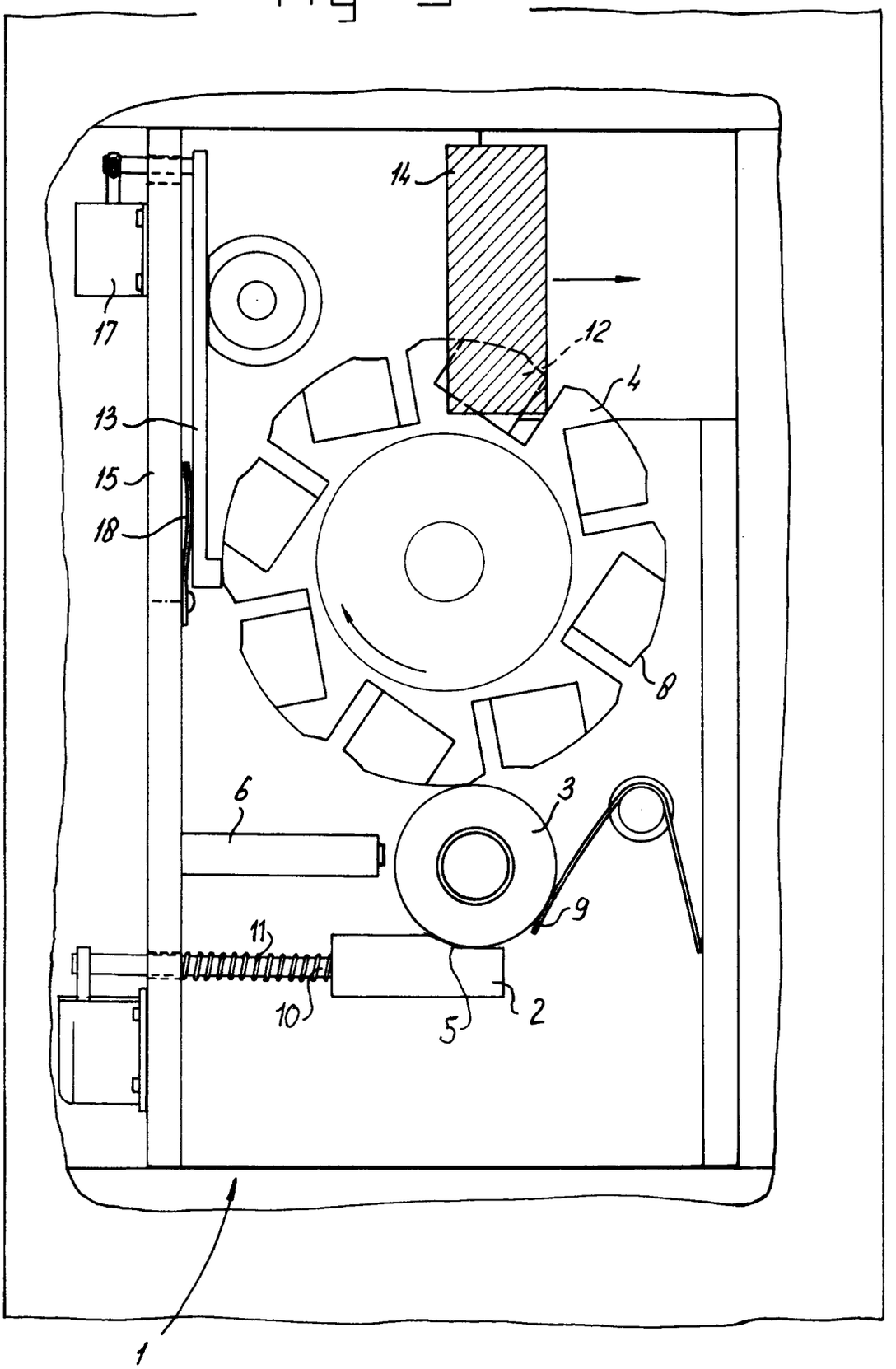


Fig-4

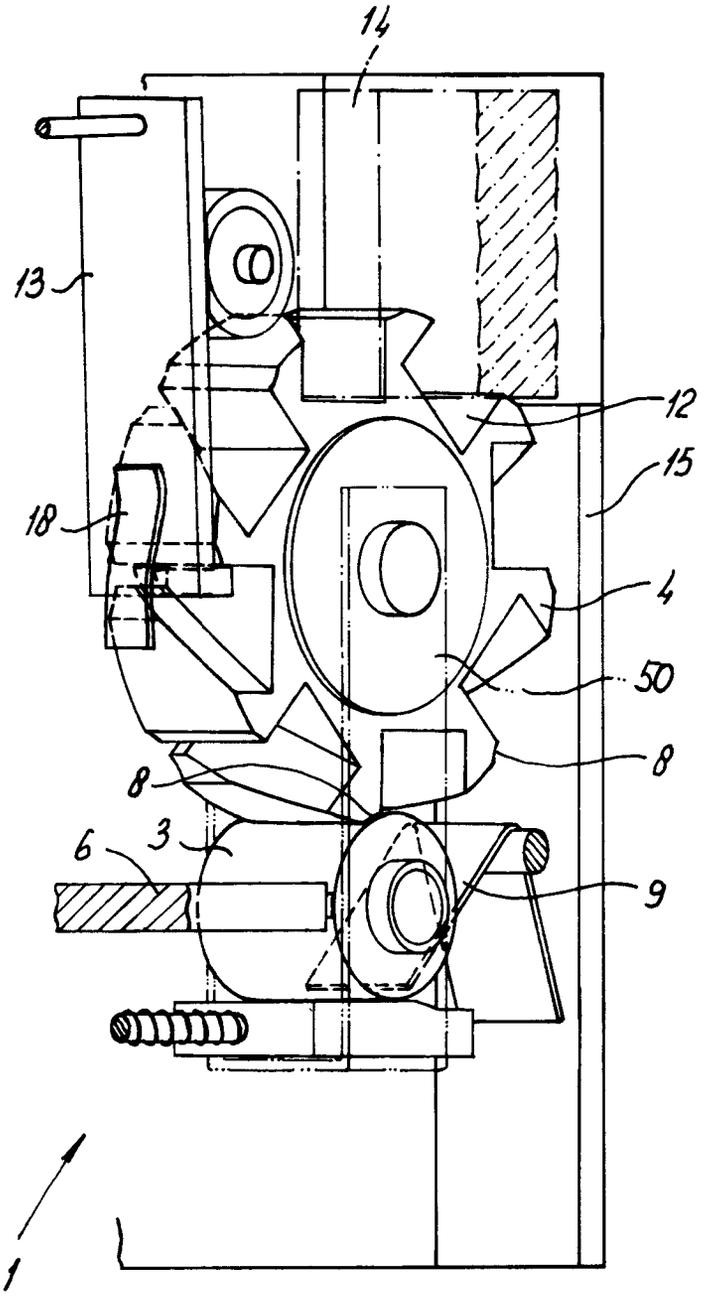


fig-5

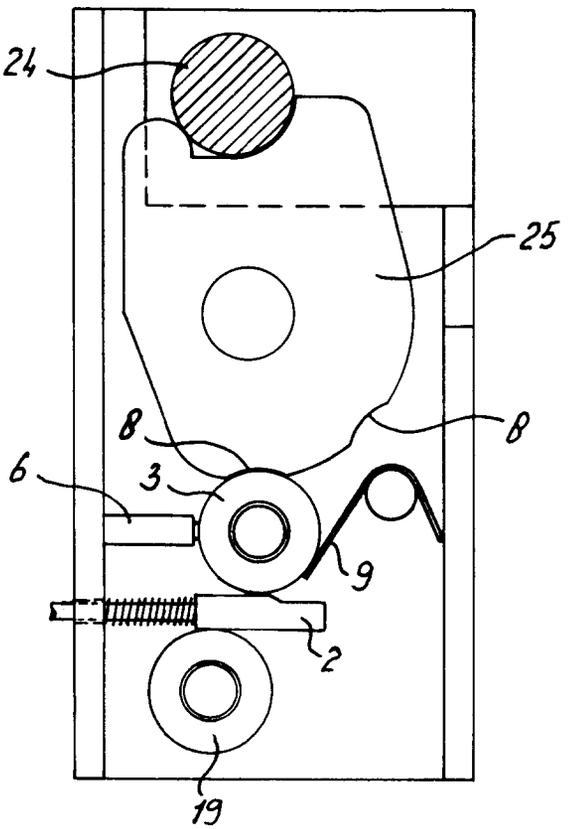
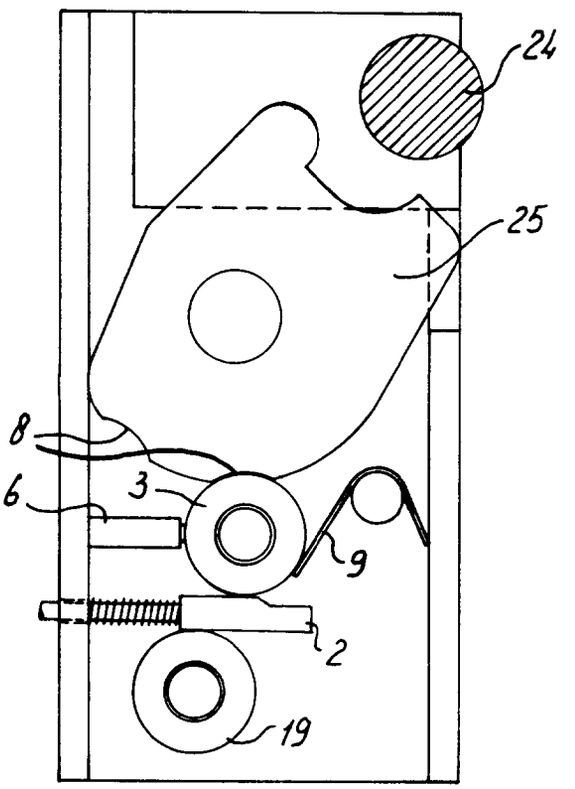


fig-6



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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 2351

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	US-A-2 919 152 (PICKLES) 29 December 1959 * the whole document *	1	E05C19/00 E05B65/32 E05B47/06
A	US-A-2 864 636 (PICKLES) 16 December 1958 * the whole document *	1	E05B63/24
A	GB-A-778 465 (FERRO STAMPING COMPANY) 10 July 1957 * the whole document *	1	
A	GB-A-785 729 (HANLOCK MANUFACTURING COMPANY) 6 November 1957	1	
A	US-A-2 494 754 (GOUGHNOUR) 17 January 1950 * the whole document *	1	
A	US-A-2 324 409 (MARPLE) 13 July 1943 * the whole document *	1	
A	US-A-2 012 341 (ERAS) 27 August 1935 * the whole document *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E05C
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 January 1997	Westin, K

CATEGORY OF CITED DOCUMENTS

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