

MANUAL CHAIN BLOCK

The present invention relates to a manual chain block, and more specifically to a manual chain block having a load sheave supported rotatably between a pair of side plates so that the load sheave can be rotated by an actuating operation of an actuating mechanism having a hand wheel to wind up and unwind a load chain looped around the load sheave.

In a conventional manual chain block adapted to rotate a load sheave by operating an actuating mechanism having a hand wheel, for example as disclosed in the Japanese Utility Model Publication No. Sho. 40 (1965) - 8997, a wheel cover for covering the actuating mechanism is attached to an outside of a side plate.

As shown in Fig. 15, this wheel cover has introducing openings 103, 104 for a hand chain 102 looped around a hand wheel 101, formed in a lower portion of a cover body 100 on its opposite sides relative to the hand wheel 101 and a lower cover side wall 105 so formed integrally with the cover body 100 between those introducing openings 103, 104 as to define lower opening edges of the introducing openings 103, 104 with the cover body 100. The cover body 100 is fixedly secured by a plurality of stay bolts 106 to an

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actuating mechanism side side plate 107 of two side plates 107. 108 for supporting a load sheave (not illustrated).

Incidentally, in Fig. 15, the symbol 109 designates a gear cover and the symbol 110 does a hand chain guide.

But, the wheel cover having the above-mentioned constitution is formed from a sheet metal, and the lower cover side wall 105 defining the lower opening edges of the introducing openings 103, 104 is formed integrally with the cover body 100 by a bending process. Thereupon, since the lower cover side wall 105 is formed of the sheet metal similarly to the cover body 100 and pushed and secured to the side plate 107 by tightening nuts 111 threadably engaged with the stay bolts 106, its strength is not enough. Therefore, the cover side wall 105 is formed comparatively wide as shown in Fig. 15.

While the opposite side edges of the cover side wall 105 define the introducing openings 103, 104, the cover side wall 105 is formed wide for attaining its sufficient strength. Accordingly, the opposite side edges of the cover side wall 105 come near to the introducing passages of the hand chain 102 passing through the introducing openings 103, 104. When the hand chain 102 is operated abruptly and violently to jump up or when a large load is imposed to the hand chain 102 to incline the whole of the chain block, the hand chain 102 is brought into contact with the edges of the cover side wall 105.

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peculiar noises are generated and the cover side wall 105 is deformed by repetition of the contact for a long term use. There is also such a deficiency that the cover side wall 105 is deformed and damaged by an impact imposed from outside thereto so that the hand chain 102 is hindered from passing or peculiar noises are generated during a normal usage.

It is a principal object of the present invention to provide a manual chain block in which durable strength of lower opening edges of a passage openings for a hand chain in a wheel cover can be increased, the lower opening edges of the passage openings are made remote from an introducing passage for the hand chain to decrease chances of the contact with the hand chain and to decrease chances of generations of peculiar noises correspondingly. the durability can be improved and generations of peculiar noises can be restrained even when the hand chain is brought into contact with the wheel cover.

It is another object of the present invention to improve the workability for mounting a hand chain guide to an interior of a wheel cover, to reinforce the wheel cover sufficiently by a hand chain guide allowing to smoothly guide the hand chain to a hand wheel and to enable a user to smoothly carry out a pulling operation of the hand chain while processability of the wheel cover can be improved in spite of the improvement of the workability.

Thus, for accomplishing the above-mentioned objects, the

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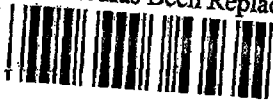
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invention resides in a manual chain block including, a load sheave which is supported rotatably between a pair of side plates and around which a load chain is looped, an actuating mechanism which is disposed outside one of the side plates and has a hand wheel for actuating the load sheave and a wheel cover which is attached to the one side plate to cover the actuating mechanism and has introducing openings for a hand chain looped around the hand wheel, wherein between the introducing openings there is provided a cover holding member having side surfaces which face introducing passages for the hand chain and define lower opening edges of the introducing openings and a cover receiving portion for receiving the wheel cover located between the introducing openings and the cover holding member is tightened together with the cover to the side plate by stay bolt means.

Conveniently, the respective side surfaces may be disposed at locations spaced apart from the introducing passages for the hand chain. Further, the cover holding member may be formed from a vibration proof material, for example such as cast iron, aluminum and synthetic resin.

Conveniently, between the introducing openings of the wheel cover for the hand chain there may be provided a short cover engaging piece having an arcuate cross-section, and an engaging surface adapted to engage with an inner surface of the cover engaging piece is formed



in the cover receiving portion of the cover holding member. Further, a seat onto which the inner surface of the wheel cover sits may be formed in the cover receiving portion with a vibration absorbing material such as a rubber packing being interposed between the seat and the inner surface of the wheel cover.

Further, the wheel cover may be located radially outside an outer peripheral portion of the hand wheel and comprise an upper side portion having a cover side wall extending to its turned down portions toward its left and right sides, left and right side portions having the introducing openings and extending along the outer peripheral portion of the hand wheel and a lower tightened portion joined to the lower portions of those side portions with protruding radially outward relative to the outer peripheral portion of the hand wheel and adapted to sit on the cover holding member and to be tightened together therewith by the stay bolt.

The arrangement may include hand chain guides each of which comprises an attachment portion interposed between a tightened portion of the wheel cover by the stay bolt and the stay bolt, a held portion adapted to be engaged and held by the side plate, a guide portion formed between the attachment portion and the held portion and facing the hand wheel to guide the hand chain looped around the hand wheel, so that the hand chain guides can be secured between the



side plate and the tightened portions of the wheel cover by tightening the stay bolts.

Further, an outer surface of the attachment portion of the hand chain guide may be so formed as to coincide with the inner surface of the cover side wall at the tightened portions of the wheel cover. The guide portion of the hand chain guide may have swelled-out portions, swelled out toward wheel flanges of the hand wheel respectively to oppose thereto, and these swelled-out portions are opposed to the wheel flanges with keeping a smaller gap than a width of the hand chain to define a guide passage for the hand chain together with the wheel flanges therebetween.

The hand chain guide may be formed from a vibration proof material such as cast iron and aluminum. A vibration proof layer may be formed on the guide portion of the hand chain guide at least on the side of hand wheel. Further, a vibration absorbing material may be interposed between the attachment portion of the hand chain guide and the tightened portion of the wheel cover.

Further, the attachment portion of the hand chain guide may be fixed to the tightened portion of the wheel cover mainly by means of the spot welding. Further, the held portion of the hand chain guide may be provided with a lug protruded from its end portion so that the lug can be fitted into a fitting hole formed in the side

plate to hold the held portion by engagement with the side plate.

The above and other objects, advantages and features of the invention will become apparent when considered with the following description of several examples of apparatus according to the invention.

In the drawings:-

Fig. 1 is a vertical sectional view showing one embodiment of a manual chain block according to the present invention;

Fig. 2 is a front view showing a wheel cover portion;

Fig. 3 is a sectional view taken along the A-A line in Fig. 2;

Fig. 4 is a sectional view showing only the wheel cover and taken along the B-B line in Fig. 2;

Fig. 5 is a side view showing the wheel cover portion;

Fig. 6 is a bottom view showing the wheel cover portion;

Fig. 7 is a perspective view showing the wheel cover;

Fig. 8 is a perspective view showing a cover holding member;

Fig. 9 is a sectional view taken along the C-C line in Fig. 8;

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Fig. 10 is a view viewed along the arrow line D;

Fig. 11 is a perspective view showing a hand chain guide;

Fig. 12 is a plan view showing the hand chain guide;

Fig. 13 is a sectional view showing another embodiment of a hand chain guide;

Fig. 14 is a sectional view showing another embodiment of a wheel cover correspondingly to Fig. 4; and

Fig. 15 is an explanatory view showing a conventional embodiment.

A manual chain block illustrated in Fig. 1 is a chain block of the manual lifting and lowering type in which a load sheave 3 around which a load chain (not illustrated) is looped is rotatably supported between a pair of first and second side plates 1, 2 through bearings 5, 6. A driving shaft 7 is passed through a shaft bore of the load sheave 3 with being provided one axial end with a hand wheel 8

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around which an endless hand chain 40 (refer to Fig. 2) is looped. A transmission mechanism 10 provided with a mechanical brake 9 is disposed between the hand wheel 8 and the driving shaft 7. The driving shaft 7 is provided at its axial other end with a reduction gear mechanism 11 having a plurality of reduction gears. A driving force is transmitted to the load sheave 3 through the transmission mechanism 10 and the reduction gear mechanism 11 by actuating the hand wheel 8 through the hand chain, so that a hanging member (not illustrated) comprising a hook and the like connected to the load side of a load chain looped around the load sheave 3 can be lifted and lowered.

The side plates 1, 2 are connected to each other by three pieces of stay bolts 12 with keeping a predetermined space therebetween. A mounting shaft 14 for a hook 13 is attached between one upper portions of those side plates 1, 2 at the locations along the tangential direction of the load sheave 3.

While a wheel cover 15 for covering the hand wheel 8 is attached to the side plate 1 and fixed thereto by nuts 17 threadably engaged with the stay bolts 12, a gear cover 16 for covering the reduction gear mechanism 11 is attached to the side plate 2 and also fixed thereto by the nuts 17.

The wheel cover 15 and the gear cover 16 are provided with radial bearings 18, 19 for the driving shaft 7 respectively, so that the driving shaft 7 can be supported rotatably at its axial opposite end portions by the covers

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15, 16 through the bearings 18, 19 separately from the load sheave 3. Thereupon, a predetermined clearance is kept between the driving shaft 7 and a shaft bore of the load sheave 3 which is supported rotatably by the side plates 1, 2 through bearing 5, 6.

The hand chain 40, the hand wheel 8 and the transmission mechanism 10 constitute an actuating mechanism 20, and the embodiment illustrated in Figs. 1 and 2 is provided with an overload prevention mechanism 21.

The transmission mechanism 10 comprises a driven hub 22 joined to the drive shaft 7 so as not to rotate relatively thereto (threadably jointed to each other in Figs.), a driving member 23 threadably engaged with the driving shaft 7, a reverse prevention gear 24 interposed between the respective flange portions of the driven hub 22 and the driving member 23 and supported rotatably by the driven hub 22 and lining plates 25, 26 interposed respectively between the driven hub 22 and the reverse prevention gear 24 and between the reverse prevention gear 24 and the driving member 23. A reverse prevention pawl 27 meshed with the reverse prevention gear 24 is swingably mounted to the side plate 1 through a pawl shaft 28. This reverse prevention pawl 27, the reverse prevention gear 24, the driven hub 22, the driving member 23 and the lining plates 25, 26 constitute the mechanical brake 9.

The overload prevention mechanism 21 supports the hand wheel 8 by a cylindrical boss portion 23a of the driving

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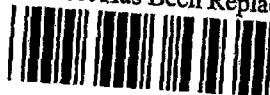
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member 23 through a one-way clutch 29 allowing to rotate in the normal driving direction, has a lining plate 30 disposed between the flange portion of the driving member 23 and a boss portion of the hand wheel 8, and also has a lining plate 31 and a press plate 32 rotatable together with the cylindrical boss portion 23a and a resilient member 33 comprising an initially coned disc spring fitted in order onto the cylindrical boss portion 23a of the driving member 23 outside the hand wheel 8, and an urging force setting adjuster 34 threadably engaged with an end of the boss portion 23a outside the resilient member 33 to optionally set a slipping load of the hand wheel 8 relative to the driving member 23 by adjusting an urging force of the resilient member 33.

Further, the reduction gear mechanism 11 comprises a first gear 35 formed integrally with a shaft end of the driving shaft 7, a pair of second gears 37, 37 supported by intermediate shafts 36, 36 respectively so as to mesh with the first gear 35, a pair of third gears 38, 38 provided in the intermediate shafts 36, 36 and a fourth gear 39 connected to an extended portion of the load sheave 3 so as to mesh with the third gears 38, 38.

Incidentally, in Fig. 1, the symbol 41 designates a wheel stopping member interposed between an axial end face of the driving member 23 and an outer ring 18a of the radial bearing 18 to restrain an axial outward shift of the hand wheel 8 through the driving member 23, the symbol 42 does a

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pawl spring adapted to urge the reverse prevention pawl 27 toward a reverse prevention gear 24. and the symbol 46 does a chain kicker.

Thus, in the above mentioned construction, when the hand wheel 8 is actuated in the normal direction by operating the hand chain, the driving shaft 7 is driven through the transmission mechanism 10 having the overload prevention mechanism 21 and the mechanical brake 9 so that the driving force is transmitted to the load sheave 3 through the reduction gear mechanism 11 to rotate the load sheave 3. Thereupon, the load side portion of the load chain 4 looped around the load sheave 3, namely the load side portion having a hook attached to its leading end thereof for hanging a cargo can be wound up to lift the cargo.

When a load larger than the slipping load set by the adjuster 34 of the overload prevention mechanism 21 acts on the load side portion of the load chain 4 at the time of lifting the cargo, the hand wheel 8 slips relative to the driving member 23 so that the cargo lifting after that is stopped. Thereupon, a level of the cargo lifted in that way is held by an action of the mechanical brake 9.

When the lifted cargo is lowered, the hand chain 40 is operated to actuate the hand wheel 8 in the reverse direction. Thereupon, the driving member 23 is retreated due to a screw effect by reversely actuating the hand wheel 8, so that the load sheave 3 is rotated reversely by alternately repeating an action and an inaction of the

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mechanical brake 9 to carry out the cargo lowering gradually.

According to the present invention, in the manual chain block having the above-mentioned constitution, lower opening edges of introducing openings 15b, 15c for the hand chain 40 formed in the wheel cover 15 are defined by using a cover holding member 50, and the lower portion of the wheel cover 15 is fixedly secured onto the side plate 1 by the stay bolt 12 through the cover holding member 50.

When explaining more in detail, as shown in Figs. 2 and 7, the wheel cover 15 is located radially outside the outer peripheral surface of the hand wheel 8 and so configured as to have an upper side portion 15d with a cover side wall 15a having opposite side extended to its turned down portions toward its left and right sides at a predetermined height, left and right side portions 15e, 15f having the introducing openings 15b, 15c for the hand chain 40 and configured along the outer peripheral portion of the hand wheel 8, and a lower tightened portion 15h joined to the lower portions of those side portions 15e, 15f with protruding radially outward relative to the outer peripheral portion of the hand wheel 8 so as to have a bolt passing opening 15g for the stay bolt 12 and adapted to sit on a seat 53 of the cover holding member 50 and to be tightened together therewith by the stay bolt 12.

In the lower tightened portion 15h of the wheel cover 15 there is provided a short cover engaging piece 15i joined

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to the side portions 15e, 15f having the introducing openings 15b, 15c formed therein and having an arcuate cross-section, and in the center portion of the wheel cover 15 there is provided a concaved portion 15j for holding the radial bearing 18 therein. Outside the concaved portion 15j there are provided an annular rib 15k and reinforcement ribs 15r extending radially outward from the annular rib 15k.

The upper side portion 15d of the wheel cover 15 has passing openings 15m for the stay bolts 15 formed at its right and left corners together with upper tightened portions 15n, 15p for nuts 17 threadably engaged with the stay bolts 12 so as to be fixed at three locations together with the lower tightened portion 15h provided in the lower portion of the wheel cover 15 when the nuts 17 are tightened relative to the stay bolts. Between the corners of the upper side portion 15d there is provided a reinforcement rib 15t running between the upper tightened portions 15n, 15p, and along the side edge portions of the respective side portions 15e, 15f there are provided reinforcement ribs 15x, 15y running between the upper tightened portions 15n, 15p and the lower tightened portion 15h. These reinforcement ribs 15x, 15y can have opened leading ends as shown in Fig. 4, but preferably have closed leading end portions in a pipe-like configuration as shown in Fig. 14.

As shown in Figs. 8 through 10, the cover holding member 50 is formed like a stay having side surfaces 51, 52 which

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define the lower opening edges of the introducing openings 15b, 15c and is provided at its lengthwise one end portion with a cover receiving portion 55 having a seat 53 onto which the inner surface of the lower tightened portion 15h of the wheel cover 15 sits and a curved engagement surface 54 with which the inner surface of the engaging piece 15i engages and provided with at its lengthwise other end portion with a pair of angular lugs 56, 57 adapted to fit into a pair of angular fitting openings 43 formed in the first side plate 1. A passing opening 53a through which the stay bolt 12 passes is formed in the seat 53, so that the cover holding member 50 can be fixedly secured to the first side plate 1 together with the cover 15 by tightening the nuts 17 threadably engaged with the projecting portions of the stay bolts 12 running along the insides of the side surfaces 51, 52 and projected from the passing opening 53a and the passing opening 15g of the tightened portion 15h respectively.

Thus, the cover holding member 50 can be fixedly secured to the first side plate 1 together with the wheel cover 15 by tightening the nut 17 threadably engaged with the stay bolt 12 at the lower side portion of the wheel cover 15 with the inner surface of the lower tightened portion 15h being seated at the seat 53 of the cover holding member 50 and the inner surface of the cover engaging piece 15i being engaged with the engagement surface of the cover receiving portion 55. Also by tightening the nuts 17 threadably engaged with

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the stay bolts 12, the upper side portion 15d of the wheel cover 15 can be fixedly secured to the first side plate 1 with the end faces of the cover side wall 15a being kept in contact with the first side plate 1 and the hand chain guides 44. 44 to be explained later interposed insides of the upper tightened portions 15n, 15p as shown in Figs. 2 and 6, so that the end faces of the cover side wall 15a are pushed against the first side plate 1 and the hand chain guides 44. 44 are fixedly secured between the inner surfaces of the upper tightened portions 15n, 15p and the first side plate 1.

Accordingly, the wheel cover 15 can be stably secured to the first side plate 1 by three pieces of stay bolts 12 as well as the introducing openings 15b, 15c whose lower opening edges are defined by the side surfaces 51, 52 of the cover holding member 50 can be provided on the opposite left and right sides of the wheel cover 15 under that secured condition.

Since the cover holding member 50 is made from another member separate from the wheel cover 15 and formed like a stay as shown in Fig. 8 to form the lower opening edges of the introducing openings 15b, 15c by its side surfaces 51, 52 in that way, it is possible to obtain a sufficient strength in comparison with a conventional embodiment which has the introducing openings formed by the cover side walls.

Thereupon, since the cover holding member 50 can have the sufficient strength as mentioned above, it is possible

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to space apart the positions of the lower opening edges from the introducing passages 60 of the hand chain 40 by narrowing a space between the side surfaces 51, 52 defining the lower opening edges, to decrease the chances of contact with the hand chain 40 by locating the side surfaces 51, 52 at the positions spaced apart from the introducing passages 60 and to decrease the generation of the contact noises and improve the durability. Further, since the cover holding member 50 can be formed separately from the wheel cover 15 made of the steel plate, it can be made of a vibration proof material such as cast iron, aluminum, synthetic resin and iron. Therefore, silence effect can be attained by the manufacturing from those materials. Thereupon, even when the hand chain 40 is brought into contact therewith, it is possible to restrain the generation of peculiar noises and at the same time to accomplish the decrease of weight by using the light material such as aluminum.

In the above-mentioned embodiment, by disposing the short cover engaging piece 15i of the arcuate cross section in the lower portion of the wheel cover 15 and making the engaging piece 15i engage with the engagement surface 54 of the cover receiving portion 55 of the cover holding member 50 the cover engaging member 15i can hold the cover receiving portion 55. Therefore, even when the impact is imposed to the wheel cover 15 from outside, it is possible to decrease the deformation of the wheel cover 15 due to the reinforcement attained by being held onto the cover

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receiving portion 55 and to stably fix the wheel cover 15 onto the first side plate 1 without any shifting of its position.

Further, in the above constitution, by interposing the vibration absorbing material 58 such as a rubber packing between the seat 53 of the cover receiving portion 55 and the inner surface of the tightened portion 15h adapted to sit on the seat 53 it is possible to effectively prevent the peculiar noises from being generated by the resonance of the cover 15 to which vibrations are transmitted when the hand chain 40 is brought into contact with the cover holding member 50.

Since the configurations of the side portions 15e, 15f of the wheel cover 15 run along the outer periphery of the hand wheel 8 as well as the lower tightened portion 15h is protruded radially downward outwardly relative to these side portions 15e, 15f, it is possible to decrease the chances of contact of the hand chain 40 with the opening edges of the introducing openings 15b, 15c formed in the side portions 15e, 15f to decrease the generation of unpleasant peculiar noises even when the hand chain 40 is operated slantly toward the axial direction of the hand wheel 8.

Next, the hand chain guide 44 will be explained hereinafter.

As shown in Figs. 2 and 3 and Figs. 6 and 7, the hand chain guide 44 comprises an attachment portion 44a having a bolt passing opening 44i and interposed between the

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tightened portion 15n, 15p of the wheel cover 15 and the stay bolt 12, a held portion 44b adapted to be engaged and held by the side plate 1 and a guide portion 44c formed between the attachment portion 44a and the held portion 44b and facing the hand wheel 8 to guide the hand chain 40 looped around the hand wheel 8 and is provided separately from the wheel cover 15. The hand chain guides 44 are fixedly secured between the side plate 1 and the tightened portions 15n, 15p of the wheel cover 15 by tightening the nuts 17 relative to the stay bolts 12.

When further explaining in detail, the hand chain guide 44 is generally formed of a thick steel plate. As shown in Figs. 11 and 12, an outer surface of the attachment portion 44a is so formed as to coincide with the inner surface of the cover side wall 15a at the tightened portion 15n, 15p of the wheel cover 15. When the attachment portion 44a is interposed between the tightened portions 15n, 15p and a stepped portion 12a of the stay bolt 12, the outer surface of the attachment portion 44a is brought into contact with the inner surface of the cover side wall 15a as shown in Fig. 12 or comes so near as to contact therewith. The guide portion 44c comprises swelled out portions 44d, 44e swelled out toward wheel flanges 8a, 8b of the hand wheel 8 to oppose thereto respectively and a concaved portion 44f concaved relative to these swelled out portions 44d, 44e. As shown in Fig. 3, the swelled out portions 44d, 44e are opposed to the wheel flanges 8a, 8b with keeping a smaller



gap than a width of the hand chain 40 to define a guide passage 45 for the hand chain 40 together with the concaved portion 44f between the the wheel flanges 8a, 8b.

Further, the held portion 44b is joined to the swelled portion 44e with being provided at its end face with a lug 44g protruded toward the side plate 1. As a fitting hole 46 for receiving the lug 44g is formed in the side plate 1 as shown in Fig. 3, the lug 44g can be fitted into the fitting hole 46 to hold the held portion 44b by the engagement with the side plate 1.

Incidentally, it is preferable to keep the outer surface of the concaved portion 44f of the guide portion 44c in contact with the stay bolt 12, but a small gap may be provided therebetween. Further, the end face of the held portion 44b is preferably brought into pressed contact with the side plate 1 by tightening the nuts 17 relative to the stay bolt 12, but a small gap may exist therebetween in the case of engaging and holding by the lug 44g.

As mentioned above, since the hand chain guides 44, 44 are fixedly secured at the tightened portions 15n, 15p together with the cover holding member 50 by tightening the nuts 17 relative to the stay bolts 12, the hand chain 40 can be guided suitably by these hand chain guides 44, 44 allowing the hand chain 40 to be smoothly operated. Further, since each hand chain guide 44 is interposed between the inner surface of the tightened portion 15n, 15p and the stepped portion 12a of the stay bolt 12 so that its

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outer surface is brought into contact with the cover side wall 15a at the tightened portions 15n, 15p or comes near thereto as well as the held portion 44b is engaged and held by the side plate 1. a box-like section can be defined between the cover side wall 15a and the side plate 1 to strongly reinforce the wheel cover 15. Therefore, even when the impact is imposed thereto from outside, it can be received by the stay bolt 12 having a large rigidity through the attachment portion 44a to effectively restrain the deformation of the wheel cover 15.

Thereupon, since the attachment portions 44a are interposed between the tightened portions 15n, 15p and the stepped portions 12a of the stay bolts 12 as well as the lug 44 is merely fitted into the fitting hole 46 of the side plate 1 and held by the engagement therebetween, it is possible to attain the above-mentioned sufficient reinforcement and to simplify the mounting. Further, since the hand chain guides 44 are provided separately from the wheel cover 15, it is possible to improve the processability of the wheel cover 15. Since the hand chain guide 44 is a small component part, its manufacturing accuracy can be improved. Furthermore, since the attachment portions 44a are interposed and fixed between the tightened portions 15n, 15p and the stepped portions 12a of the stay bolts 12, the assembling accuracy can be improved as well as shifts of their positions can be avoided.

Further, by forming the hand chain guide 44 from the

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vibration proof material such as cast iron, aluminum and synthetic resin besides being formed of the thick steel plate it is possible to effectively restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith.

As shown in Fig. 13, by coating the whole surface of the hand chain guide 44 or at least the surface thereof facing the hand wheel 8 with the synthetic resin and the like so as to form a vibration proof layer 48 it is possible to effectively restrain the generation of peculiar noises caused by the contact with the hand chain guide 44.

Further, as shown in Fig. 3, by interposing a vibration absorbing material 49 such as the rubber packing between the attachment portion 44a and the tightened portion 15n, 15p it is possible to prevent unpleasant peculiar noises from being generated by the resonance of the wheel cover 15 even when the hand chain 40 is brought into contact with the hand chain guide 44.

The hand chain guide 44 can be readily mounted by interposing the attachment portion 44a between the tightened portion 15n, 15p and the stay bolt 12 and fitting the lug 44g of the held portion 44b into the fitting hole 46 of the side plate 1. But, its mountability can be further improved by fixing the attachment portion 44a to the tightened portion 15n, 15p mainly by means of a spot welding.

Incidentally, in the above-mentioned embodiment, though the overload prevention mechanism 21 is assembled in the

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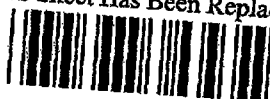
manual actuating mechanism 20, this overload prevention mechanism 21 is not always needed and also the reduction gear mechanism 11 may be omitted.

Further, though the driving shaft 7 is supported at its axial opposite end portions by the radial bearings 18, 19 provided in the wheel cover 15 and the gear cover 16, it may be supported by the load sheave 3 or supported at its axial one end portion by one of the wheel cover 15 and the gear cover 16 and at its intermediate shaft portion by the load sheave 3.

Next, functions and advantages of the present invention as constituted above will be explained hereinafter.

Since the cover holding member 50 is provided separately from the wheel cover 15 so that the wheel cover 15 can be received by the cover receiving portion 55 of the cover holding member 50 and fixed by being tightened together with the cover 15 by the stay bolts 12, an enough strength can be obtained in comparison with the conventional embodiment in which the introducing openings are formed by the cover side wall, the durable strength of the lower opening edge of the introducing opening can be increased and the strength of the cover holding member 50 can be obtained sufficiently.

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Thereupon, the locations of the lower opening edges can be made remote from the introducing passages 60 of the hand chain 40 passing through the introducing openings by narrowing a width between the side surfaces 51, 52 defining the lower opening edges of the introducing openings. Accordingly, it is possible to decrease the chances of contact with the hand chain, to decrease the chances of generation of noises and to improve the durability. Further, since the cover holding member 50 is formed as a separate member from the wheel cover 15, it is possible to restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith and also to decrease the weight in case that it is formed from a light material such as aluminum.

Since the respective side surfaces 51, 52 of the cover holding member 50 are disposed at the locations remote from the introducing passages 60 of the hand chain 40, even when the whole of the chain block is made to jump by an abrupt and violent operation of the hand chain 40 or inclined by an effect of a large load, it is possible to decrease the chances of contact of the hand chain 40 with the side surfaces 51, 52 to improve its silencing effect and to improve the durability.

Further, since the cover holding member 50 is formed from the vibration proof material, it is possible to effectively

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restrain the generation of unpleasant peculiar noises even when the hand chain 40 is brought into contact therewith.

Since the cover engaging piece 15i is disposed in the wheel cover 15 and the engagement surface 54 is disposed in the cover holding member 50, the cover engaging piece 15i can hold the cover holding member 50. Therefore, when an impact is imposed to the wheel cover 15 from outside, it becomes possible to decrease a deformation of the cover 15 due to the reinforcement attained by holding the cover receiving portion 55 by the cover engaging piece 15i and to fix the cover 15 onto the side plate 1 stably without causing a shift of its position.

Further, since the seat 53 is formed in the cover receiving portion 55 and the vibration absorbing material 58 such as a rubber packing is interposed between the seat 53 and the inner surface of the wheel cover 15, even though the hand chain 40 comes into contact with the cover holding member 50, it becomes possible to effectively prevent large abnormal noises from being generated by a resonance of the wheel cover 15 caused by contact vibrations transmitted to the cover 15 and to improve a sound proof effect.

Since the left and right side portions 15e, 15f of the wheel cover 15 provided with the introducing openings 15b, 15c is so formed as to extend along the outer peripheral portion of



the hand wheel 8 and the lower tightened portion 15h is so formed as to protrude radially outward relative to the outer peripheral portion of the hand wheel 8, even though the hand chain 40 is operated slantly relative to the axial direction of the hand wheel 8, it is possible to decrease such a chance that the hand chain 40 is brought into contact with opening edges of the introducing openings 15b, 15c formed in the side portions 15e, 15f and to restrain the generation of unpleasant abnormal noises.

Since the hand chain guides 44 comprise the attachment portions 44a, the held portions 44b and the guide portions 44c with the attachment portions 44a being interposed between the tightened portions of the wheel cover 15 by the stay bolt 12 and the stay bolts 12 and the held portion 44b being adapted to be engaged and held by the side plate 1, they can be strongly fixed between the tightened portions of the wheel cover 15 and the side plate 1 without causing a shift of their positions by tightening the stay bolts 12 without welding. Owing to that fixing therebetween without any welding, it becomes possible to improve the assembling capability. Further, since the hand chain guide 44 is formed separately from the wheel cover 15 and fixed therebetween as mentioned above, it is possible to improve the workability of the wheel cover 15 and also to improve the processing accuracy. Furthermore, since the attachment portions 44a are interposed between the tightened portions



and the stay bolts 12 and fixed therebetween, it is possible to improve the assembling accuracy without causing a shift of the assembly position.

In addition thereto, since the hand chain guide 44 has the attachment portion 44a interposed between the tightened portion and the stay bolt 12 and the held portion 44b held and engaged with the side plate 1, it is possible to define a box-like section together with the cover side wall 15a of the wheel cover 15 and the side plate 1, so that the wheel cover 15 can be reinforced sufficiently by the hand chain guides 44.

Since the outer surface of the attachment portion 44a is so formed as to coincide with the inner surface of the cover side wall 15a, the outer surface of the attachment portion 44a is brought into contact with the inner surface of the cover side wall 15a or comes near thereto. Therefore, when an impact is imposed thereon from outside, the cover side wall 15a is going to deform inward. But, that impact is received by the stay bolts of the high rigidity through the attachment portions 44a of the hand chain guides 44 to restrain a deformation of the wheel cover 15 effectively, so that a reinforcement function for the wheel cover 15 can be further improved.

Since the guide passage 45 is formed in the guide portion 44c, even the hand chain 40 jumps within the wheel cover 15.

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it is possible to prevent the chain 40 from getting out of the hand wheel 8 and it becomes possible to carry out a smooth operation of the hand chain 40.

Since the hand chain guide 44 is formed from a vibration proof material, even when the hand chain 40 is brought into contact with the hand chain guides 44, it is possible to restrain the generation of peculiar noises. According to the invention as set forth in claim 11, since the vibration proof layer 48 is formed on the guide portion 44c of the hand chain guide 44, similarly to the hand chain guide 44 formed from the vibration proof material, it is possible to restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith.

Since the vibration absorbing material 49 such as the rubber packing is interposed between the attachment portion 44a and the tightened portion of the wheel cover 15, even when the hand chain is brought into contact with the hand chain guide 44, it is possible to prevent unpleasant peculiar noises from being generated by the resonance of the wheel cover 15. Further, according to the invention as set forth in claim 13, since the attachment portions 44a of the hand chain guides 44 are fixed to the tightened portions of the wheel cover 15 by means of a spot welding, it is possible to improve the interposing workability for interposing the hand chain guides 44 between the wheel cover 15 and the side

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plate 1. Thereupon, since that fixation is not intended to reinforce the wheel cover 15 by the hand chain guides 44 but merely intended to connect them for preventing the separation therebetween, it is possible to not only improve the mountability but also reinforce the wheel cover 15 sufficiently by the above mentioned fixation.

Since the held portion 44b is provided with the lug 44g so that the lug 44g can be fitted into the fitting hole 46 formed in the side plate 1 to hold the held portion 44b by engagement with the side plate 1, the hand chain guide 44 can be strongly secured and held by the side plate 1. Thereupon, the box-like section defined by the side wall 15a, the side plate 1 and the hand chain guide 44 can be made stronger so that the reinforcement of the wheel cover 15 can be accomplished more securely by that box-like section.

It will be understood that the above description has been given with reference to preferred embodiments of the invention. However, various modifications may be made within the scope of the invention as defined by the following claims.

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What is claimed is:

1. A manual chain block including a pair of side plates (1,2), a load sheave (3) which is supported rotatably between said side plates and around which a load chain is looped, an actuating mechanism (20) which is disposed outside one (1) of said side plates and has a hand wheel (8) for actuating said load sheave (3) and a wheel cover (15) which is attached to the one of said side plates (1) to cover said actuating mechanism (20) and has introducing openings (15b, 15c) for a hand chain (40) looped around said hand wheel (8), wherein between said introducing openings (15b, 15c) there is provided a cover holding member (50) having side surfaces (51, 52) which face introducing passages (60) for said hand chain (40) and define lower opening edges of said introducing openings (15b, 15c) and a cover receiving portion (55) for receiving said wheel cover (15) located between the introducing openings (15b, 15c) and said cover holding member (50) is tightened together with said cover (15) to said side plate (1) by stay bolt means (12).
2. A manual chain block as set forth in claim 1, wherein said respective side surfaces (51, 52) are disposed at locations spaced apart from said introducing passages (60) for said hand chain (40).
3. A manual chain block as set forth in claim 1, wherein said cover holding member (50) is formed from a vibration proof material.

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4. A manual chain block as set forth in claim 1, wherein said wheel cover has a short cover engaging piece (15i) having an arcuate cross-section disposed between the lower portions of said introducing openings (15b, 15c) for the hand chain, and an engaging surface (54) adapted to engage with the inner surface of said cover engaging piece (15i) is formed in the cover receiving portion of said cover holding member (50).

5. A manual chain block as set forth in claim 1, wherein said cover receiving portion has a seat (53) onto which the inner surface of said wheel cover (15) sits, and a vibration absorbing material (58) is interposed between the seat (53) and the inner surface of said wheel cover (15).

6. A manual chain block as set forth in claim 1, wherein said wheel cover (15) is located radially outside an outer peripheral portion of said hand wheel (8) and comprises an upper side portion (15d) having a cover side wall (15a) extending to its turned down portions toward its left and right sides, left and right side portions (15e, 15f) having the introducing openings (15b, 15c) for the hand chain and extending along the outer peripheral portion of said hand wheel (8) and a lower tightened portion (15h) joined to the lower portions of said side portions (15e, 15f) with protruding radially outward relative to the outer peripheral portion of said hand wheel (8) and adapted to sit on said cover holding member (50) and to be tightened together with said cover holding member by the stay bolt means (12).

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7. A manual chain block as set forth in claim 1, wherein said hand chain guide (44) comprises an attachment portion (44a) interposed between a tightened portion of said wheel cover (15) by the stay bolt (12) and the stay bolt (12), a held portion (44b) adapted to be engaged and held by said side plate (1), a guide portion (44c) formed between said attachment portion (44a) and said held portion (44b) and facing said hand wheel (8) to guide said hand chain (40) looped around said hand wheel (8), so that the hand chain guides (44) can be secured between said side plate (1) and the tightened portions of said wheel cover (15) by tightening the stay bolts (12).

8. A manual chain block as set forth in claim 7, wherein the attachment portion of said hand chain guide has an outer surface (44a) which coincides with the inner surface of said cover side wall (15a) of the tightened portion of the wheel cover (15).

9. A manual chain block as set forth in claim 7, wherein the guide portion (44c) of said hand chain guide (44) has swelled-out portions (44d, 44e) swelled out towards wheel flanges (8a, 8b) of said hand wheel (8) respectively to oppose thereto, and these swelled-out portions (44d, 44e) are opposed to the wheel flanges (8a) with keeping a smaller gap than a width of the hand chain (40) to define a guide passage (45) for the hand chain (40) together with the wheel flanges (8a, 8b) therebetween.

10. A manual chain block as set forth in claim 7, wherein said hand chain guide (44) is formed from a vibration proof





material.

11. A manual chain block as set forth in claim 7, wherein a vibration proof layer (48) is formed on the surface of the guide portion (44c) of said hand chain guide (44) at least on the side of hand wheel (8).

12. A manual chain block as set forth in claim 7, wherein a vibration absorbing material (49) is interposed between the attachment portion (44a) of said hand chain guide (44) and the tightened portion of said wheel cover (15).

13. A manual chain block as set forth in claim 7, wherein the attachment portion (44a) of said hand chain guide (44) is fixed to the tightened portion of said wheel cover (15).

14. A manual chain block as set forth in claim 7, wherein the held portion (44b) of said hand chain guide (44) is provided with a lug (44g) protruded from its end portion, and said side plate (1) is provided with a fitting hole (46) for receiving said lug (44g).

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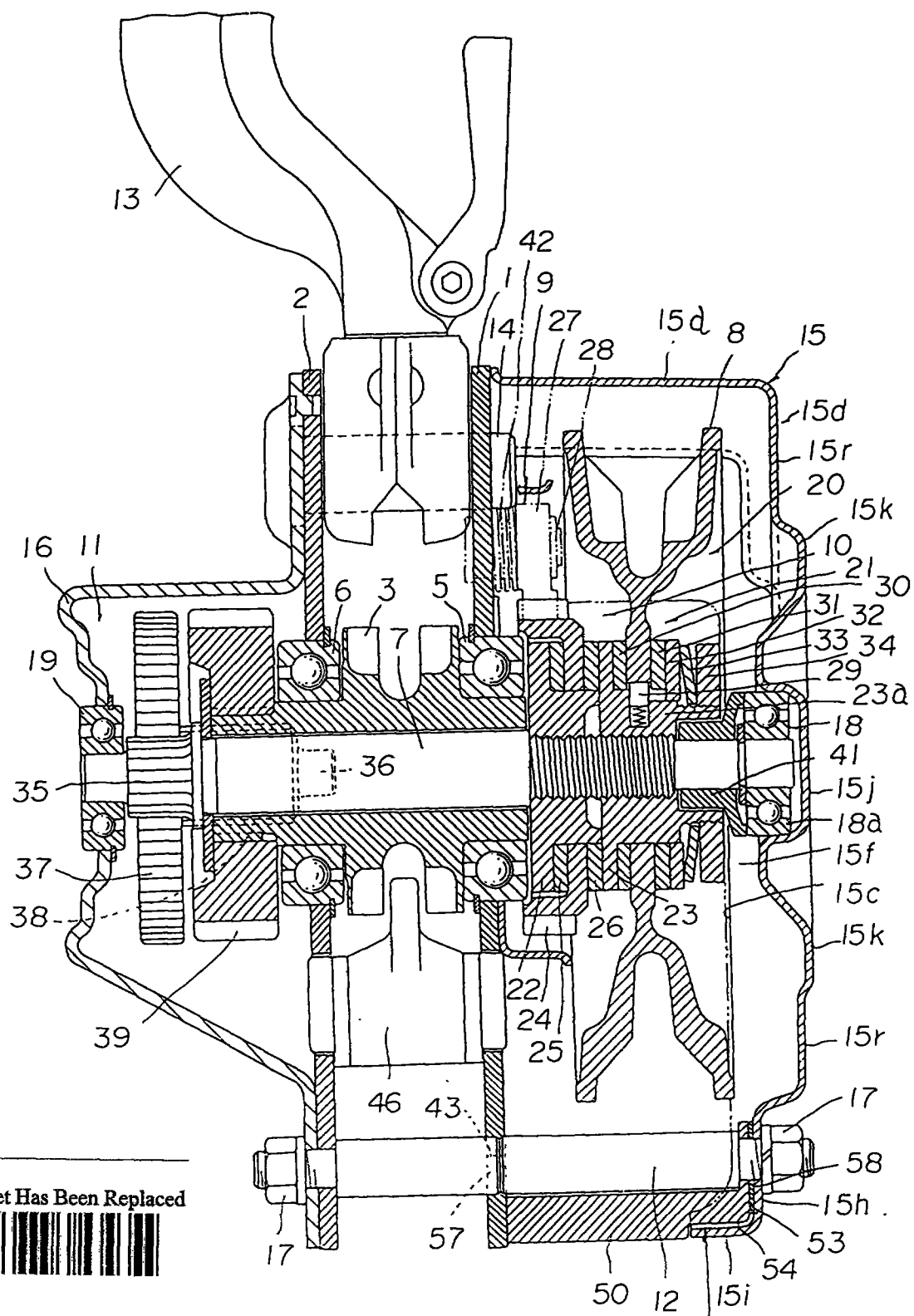
MANUAL CHAIN BLOCKABSTRACT

The invention relates to a manual chain block in which there is provided a cover holding member 50 having side surfaces 51, 52 which define lower opening edges of introducing openings 15b, 15c for a hand chain 40 and a cover receiving portion 55 which is located between the introducing openings 15b, 15c to receive the wheel cover 15. The cover holding member 50 is tightened by stay bolts 12 onto a side plate 1 together with the wheel cover 15.

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FIG. 1

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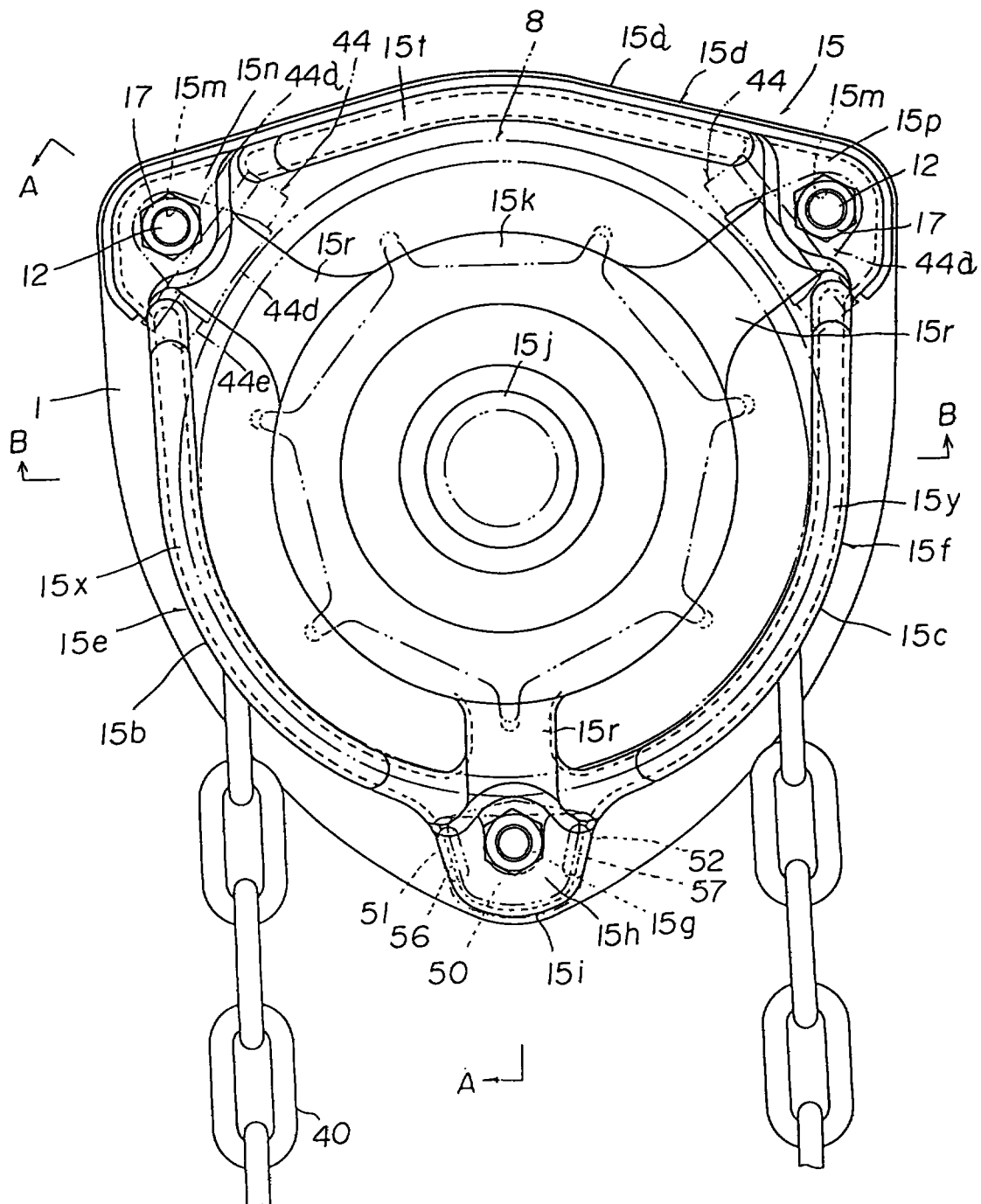
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FIG.2



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FIG.3

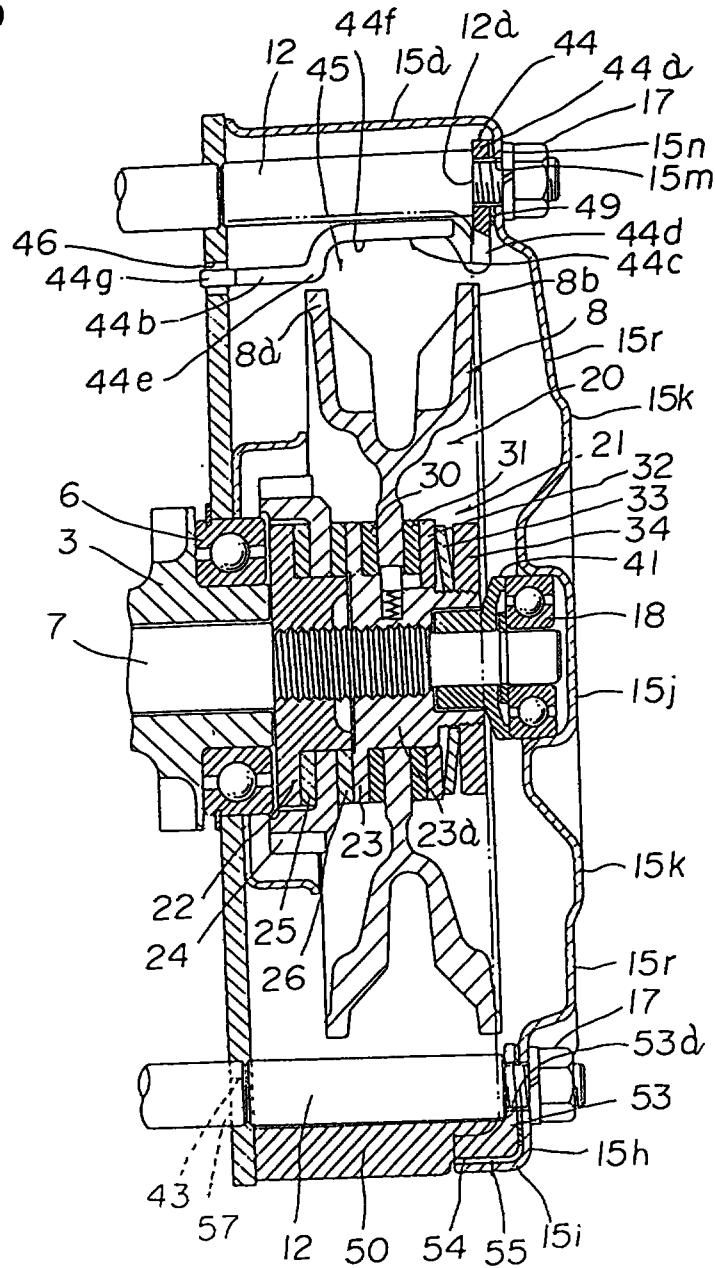
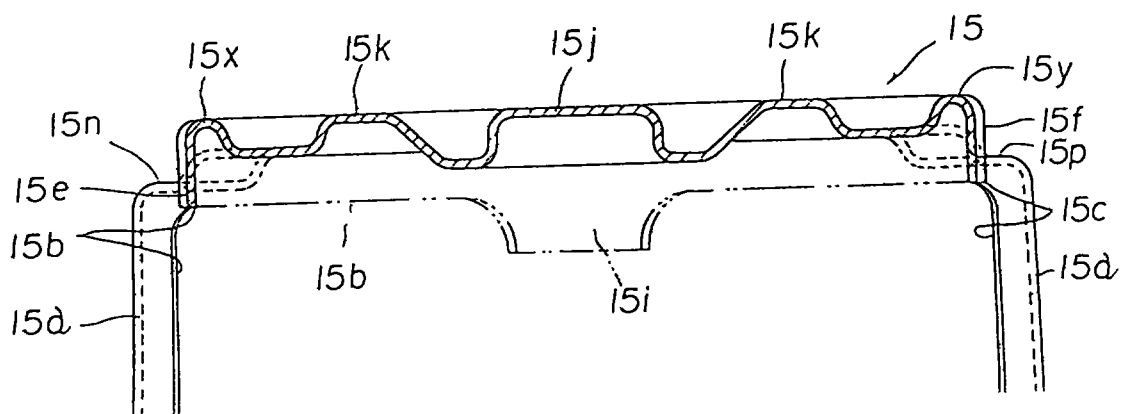


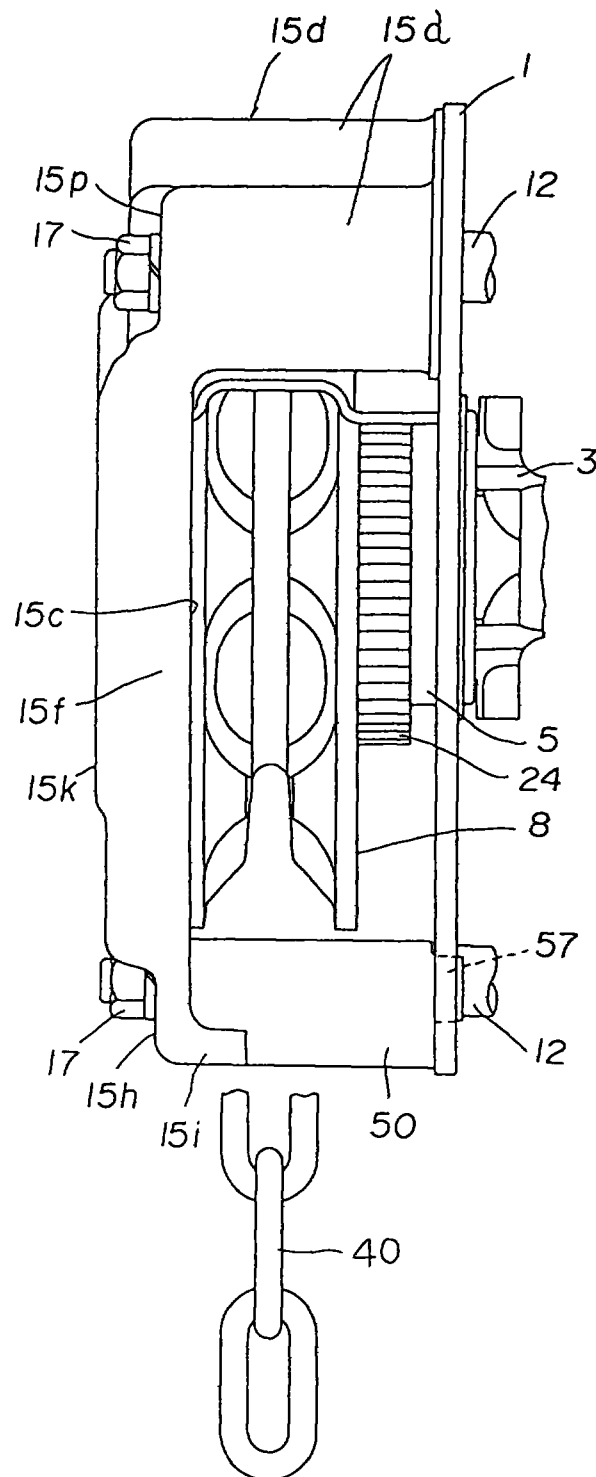
FIG.4



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FIG.5



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FIG.6

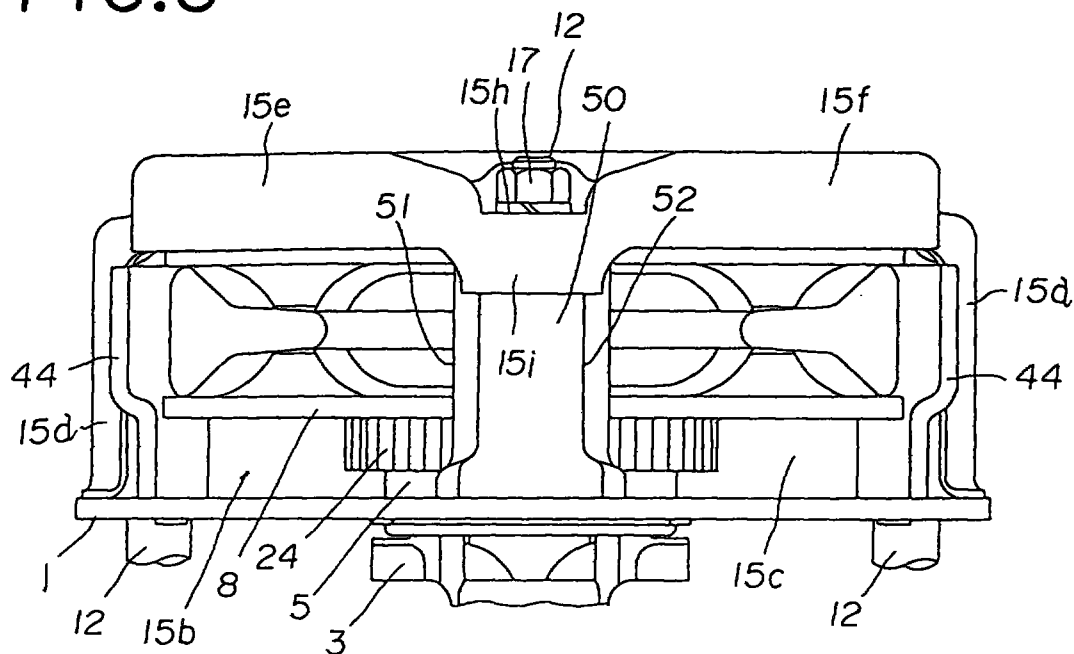
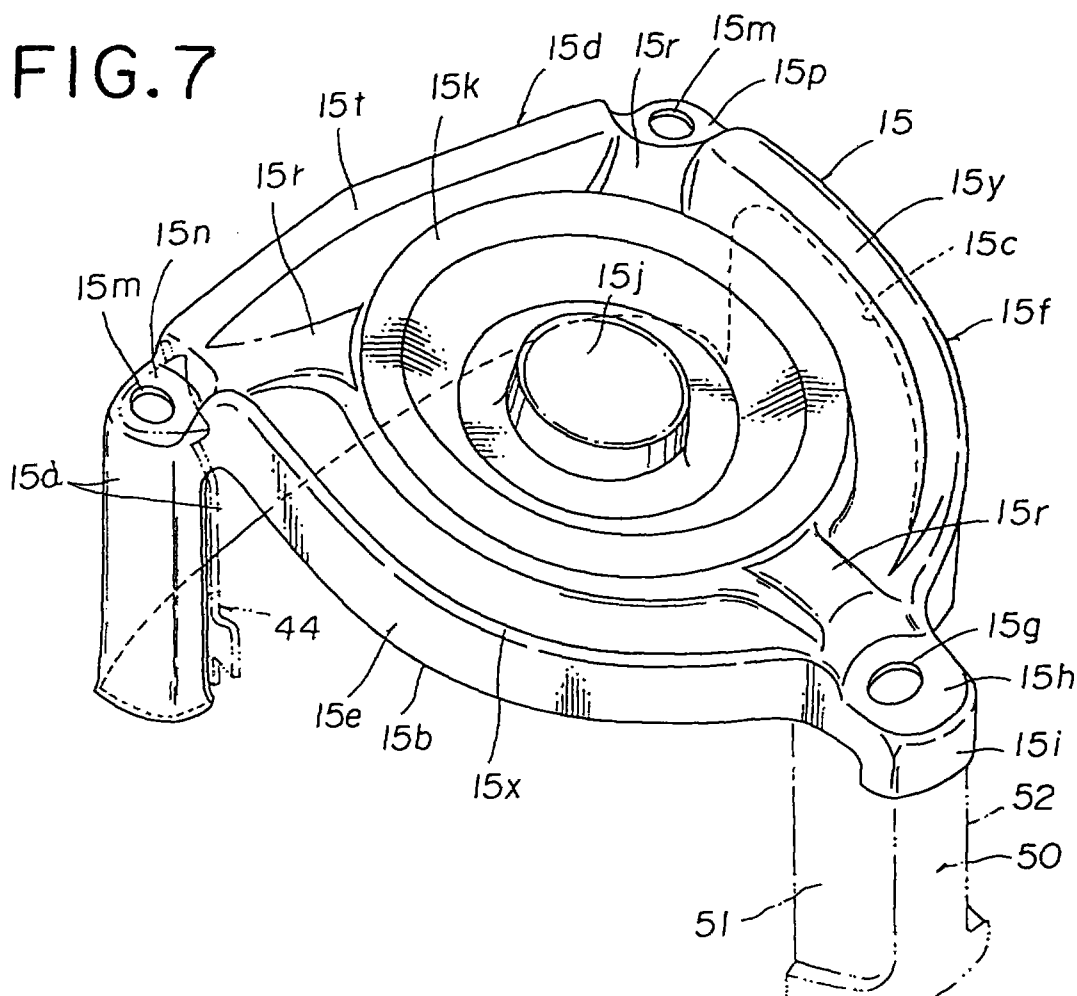
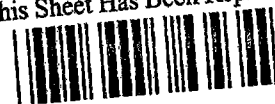


FIG.7





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FIG.8

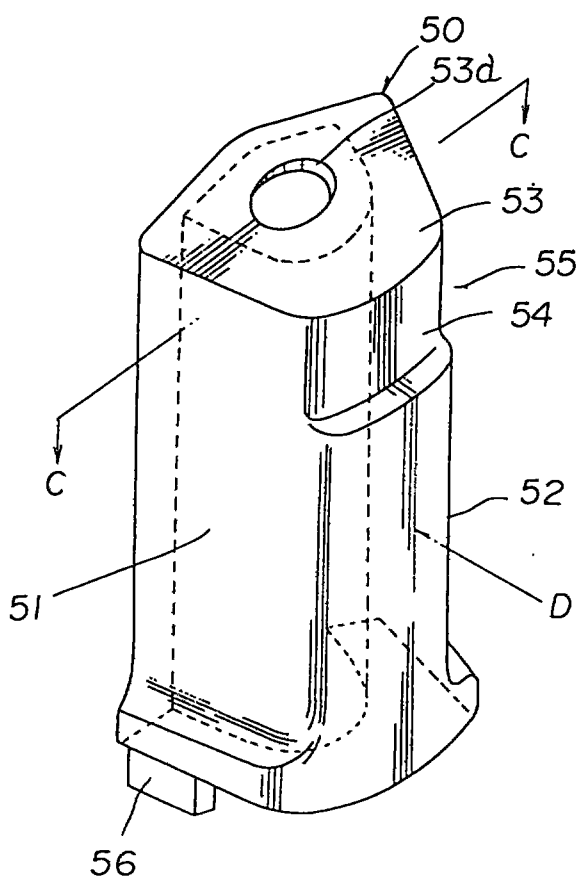


FIG.10

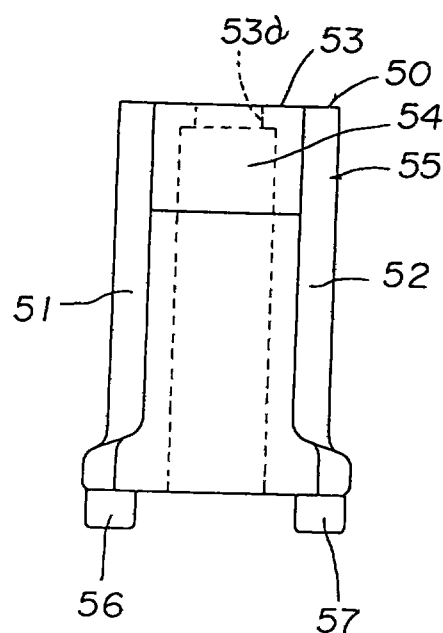


FIG.9

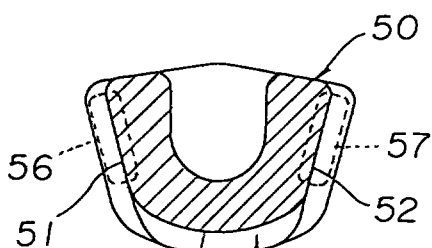
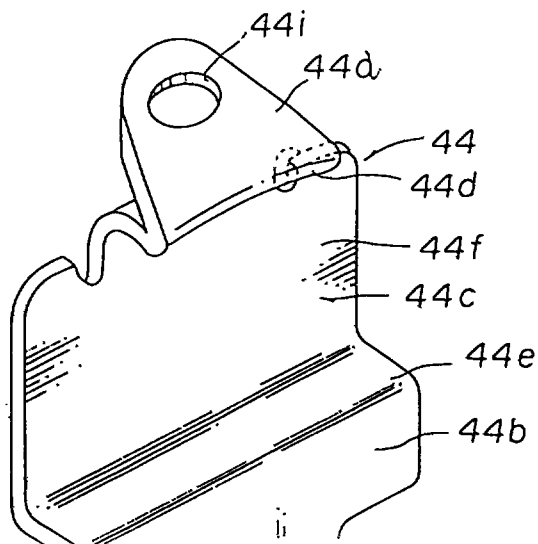


FIG.11



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FIG.12

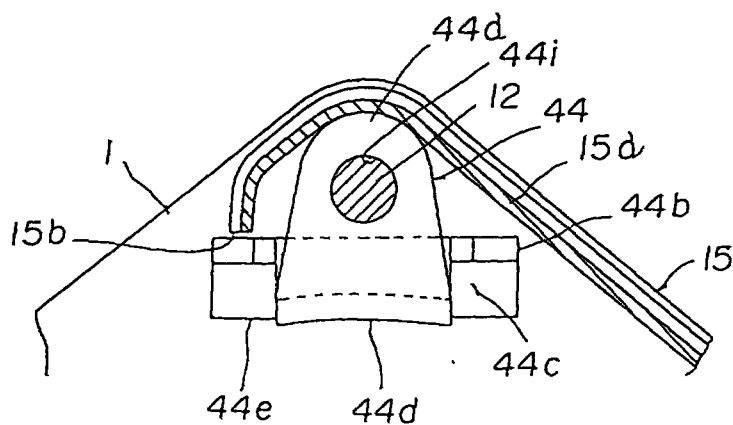


FIG.13

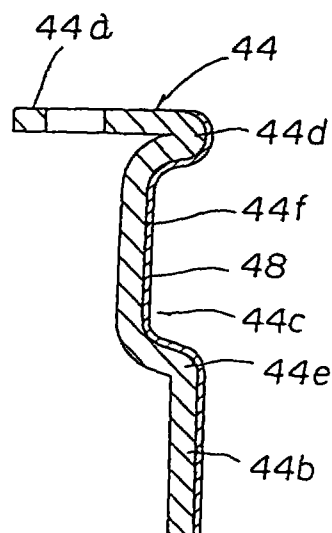
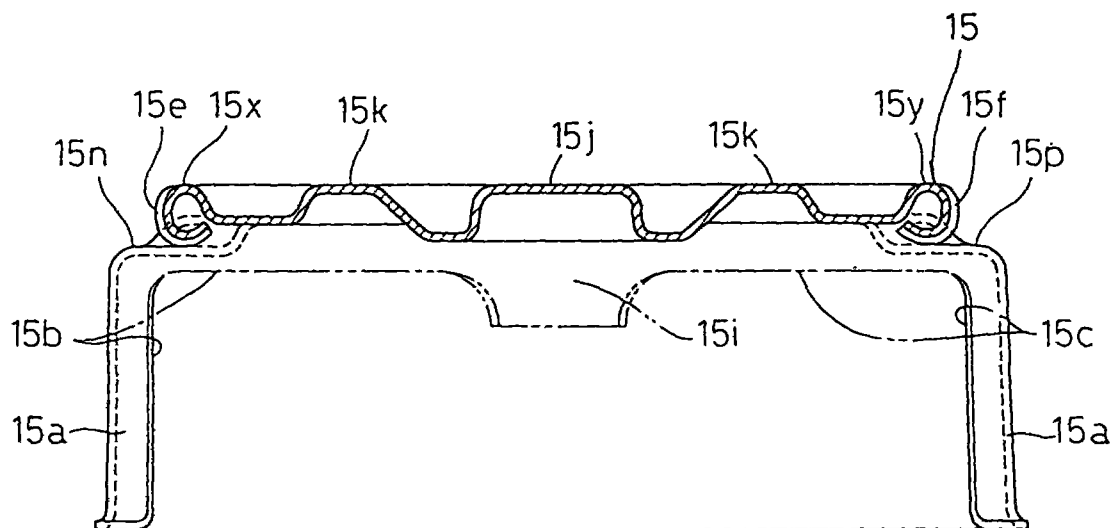
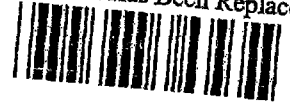


FIG.14



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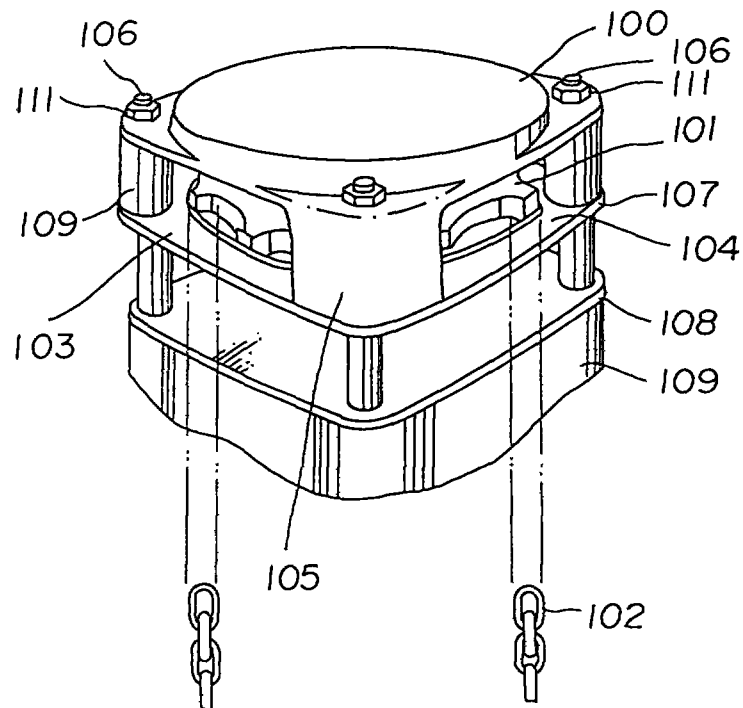
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FIG.15

PRIOR ART



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MANUAL CHAIN BLOCK

The present invention relates to a manual chain block, and more specifically to a manual chain block having a load sheave supported rotatably between a pair of side plates so that the load sheave can be rotated by an actuating operation of an actuating mechanism having a hand wheel to wind up and unwind a load chain looped around the load sheave.

In a conventional manual chain block adapted to rotate a load sheave by operating an actuating mechanism having a hand wheel, for example as disclosed in the Japanese Utility Model Publication No. Sho. 40 (1965) - 8997, a wheel cover for covering the actuating mechanism is attached to an outside of a side plate.

As shown in Fig. 15, this wheel cover has introducing openings 103, 104 for a hand chain 102 looped around a hand wheel 101, formed in a lower portion of a cover body 100 on its opposite sides relative to the hand wheel 101 and a lower cover side wall 105 so formed integrally with the cover body 100 between those introducing openings 103, 104 as to define lower opening edges of the introducing openings 103, 104 with the cover body 100. The cover body 100 is fixedly secured by a plurality of stay bolts 106 to an

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actuating mechanism side side plate 107 of two side plates 107, 108 for supporting a load sheave (not illustrated).

Incidentally, in Fig. 15, the symbol 109 designates a gear cover and the symbol 110 does a hand chain guide.

But, the wheel cover having the above-mentioned constitution is formed from a sheet metal, and the lower cover side wall 105 defining the lower opening edges of the introducing openings 103, 104 is formed integrally with the cover body 100 by a bending process. Thereupon, since the lower cover side wall 105 is formed of the sheet metal similarly to the cover body 100 and pushed and secured to the side plate 107 by tightening nuts 111 threadably engaged with the stay bolts 106, its strength is not enough. Therefore, the cover side wall 105 is formed comparatively wide as shown in Fig. 15.

While the opposite side edges of the cover side wall 105 define the introducing openings 103, 104, the cover side wall 105 is formed wide for attaining its sufficient strength. Accordingly, the opposite side edges of the cover side wall 105 come near to the introducing passages of the hand chain 102 passing through the introducing openings 103, 104. When the hand chain 102 is operated abruptly and violently to jump up or when a large load is imposed to the hand chain 102 to incline the whole of the chain block, the hand chain 102 is brought into contact with the edges of the cover side wall 105.

Thereby, there appear such problems that uncomfortable

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peculiar noises are generated and the cover side wall 105 is deformed by repetition of the contact for a long term use. There is also such a deficiency that the cover side wall 105 is deformed and damaged by an impact imposed from outside thereto so that the hand chain 102 is hindered from passing or peculiar noises are generated during a normal usage.

It is a principal object of the present invention to provide a manual chain block in which durable strength of lower opening edges of a passage openings for a hand chain in a wheel cover can be increased. the lower opening edges of the passage openings are made remote from an introducing passage for the hand chain to decrease chances of the contact with the hand chain and to decrease chances of generations of peculiar noises correspondingly. the durability can be improved and generations of peculiar noises can be restrained even when the hand chain is brought into contact with the wheel cover.

It is another object of the present invention to improve the workability for mounting a hand chain guide to an interior of a wheel cover. to reinforce the wheel cover sufficiently by a hand chain guide allowing to smoothly guide the hand chain to a hand wheel and to enable a user to smoothly carry out a pulling operation of the hand chain while processability of the wheel cover can be improved in spite of the improvement of the workability.

Thus, for accomplishing the above-mentioned objects, the



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invention resides in a manual chain block including, a load sheave which is supported rotatably between a pair of side plates and around which a load chain is looped, an actuating mechanism which is disposed outside one of the side plates and has a hand wheel for actuating the load sheave and a wheel cover which is attached to the one side plate to cover the actuating mechanism and has introducing openings for a hand chain looped around the hand wheel, wherein between the introducing openings there is provided a cover holding member having side surfaces which face introducing passages for the hand chain and define lower opening edges of the introducing openings and a cover receiving portion for receiving the wheel cover located between the introducing openings and the cover holding member is tightened together with the cover to the side plate by stay bolt means.

Conveniently, the respective side surfaces may be disposed at locations spaced apart from the introducing passages for the hand chain. Further, the cover holding member may be formed from a vibration proof material, for example such as cast iron, aluminum and synthetic resin.

Conveniently, between the introducing openings of the wheel cover for the hand chain there may be provided a short cover engaging piece having an arcuate cross-section, and an engaging surface adapted to engage with an inner surface of the cover engaging piece is formed



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in the cover receiving portion of the cover holding member. Further, a seat onto which the inner surface of the wheel cover sits may be formed in the cover receiving portion with a vibration absorbing material such as a rubber packing being interposed between the seat and the inner surface of the wheel cover.

Further, the wheel cover may be located radially outside an outer peripheral portion of the hand wheel and comprise an upper side portion having a cover side wall extending to its turned down portions toward its left and right sides, left and right side portions having the introducing openings and extending along the outer peripheral portion of the hand wheel and a lower tightened portion joined to the lower portions of those side portions with protruding radially outward relative to the outer peripheral portion of the hand wheel and adapted to sit on the cover holding member and to be tightened together therewith by the stay bolt.

The arrangement may include hand chain guides each of which comprises an attachment portion interposed between a tightened portion of the wheel cover by the stay bolt and the stay bolt, a held portion adapted to be engaged and held by the side plate, a guide portion formed between the attachment portion and the held portion and facing the hand wheel to guide the hand chain looped around the hand wheel, so that the hand chain guides can be secured between the



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side plate and the tightened portions of the wheel cover by tightening the stay bolts.

Further, an outer surface of the attachment portion of the hand chain guide may be so formed as to coincide with the inner surface of the cover side wall at the tightened portions of the wheel cover. The guide portion of the hand chain guide may have swelled-out portions, swelled out toward wheel flanges of the hand wheel respectively to oppose thereto, and these swelled-out portions are opposed to the wheel flanges with keeping a smaller gap than a width of the hand chain to define a guide passage for the hand chain together with the wheel flanges therebetween.

The hand chain guide may be formed from a vibration proof material such as cast iron and aluminum. A vibration proof layer may be formed on the guide portion of the hand chain guide at least on the side of hand wheel. Further, a vibration absorbing material may be interposed between the attachment portion of the hand chain guide and the tightened portion of the wheel cover.

Further, the attachment portion of the hand chain guide may be fixed to the tightened portion of the wheel cover mainly by means of the spot welding. Further, the held portion of the hand chain guide may be provided with a lug protruded from its end portion so that the lug can be fitted into a fitting hole formed in the side

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plate to hold the held portion by engagement with the side plate.

The above and other objects, advantages and features of the invention will become apparent when considered with the following description of several examples of apparatus according to the invention.

In the drawings:-

Fig. 1 is a vertical sectional view showing one embodiment of a manual chain block according to the present invention;

Fig. 2 is a front view showing a wheel cover portion;

Fig. 3 is a sectional view taken along the A-A line in Fig. 2;

Fig. 4 is a sectional view showing only the wheel cover and taken along the B-B line in Fig. 2;

Fig. 5 is a side view showing the wheel cover-portion;

Fig. 6 is a bottom view showing the wheel cover portion;

Fig. 7 is a perspective view showing the wheel cover;

Fig. 8 is a perspective view showing a cover holding member;

Fig. 9 is a sectional view taken along the C-C line in Fig. 8;

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Fig. 10 is a view viewed along the arrow line D;

Fig. 11 is a perspective view showing a hand chain guide;

Fig. 12 is a plan view showing the hand chain guide;

Fig. 13 is a sectional view showing another embodiment of a hand chain guide;

Fig. 14 is a sectional view showing another embodiment of a wheel cover correspondingly to Fig. 4; and

Fig. 15 is an explanatory view showing a conventional embodiment.

A manual chain block illustrated in Fig. 1 is a chain block of the manual lifting and lowering type in which a load sheave 3 around which a load chain (not illustrated) is looped is rotatably supported between a pair of first and second side plates 1, 2 through bearings 5, 6. A driving shaft 7 is passed through a shaft bore of the load sheave 3 with being provided one axial end with a hand wheel 8

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around which an endless hand chain 40 (refer to Fig. 2) is looped. A transmission mechanism 10 provided with a mechanical brake 9 is disposed between the hand wheel 8 and the driving shaft 7. The driving shaft 7 is provided at its axial other end with a reduction gear mechanism 11 having a plurality of reduction gears. A driving force is transmitted to the load sheave 3 through the transmission mechanism 10 and the reduction gear mechanism 11 by actuating the hand wheel 8 through the hand chain, so that a hanging member (not illustrated) comprising a hook and the like connected to the load side of a load chain looped around the load sheave 3 can be lifted and lowered.

The side plates 1, 2 are connected to each other by three pieces of stay bolts 12 with keeping a predetermined space therebetween. A mounting shaft 14 for a hook 13 is attached between one upper portions of those side plates 1, 2 at the locations along the tangential direction of the load sheave 3.

While a wheel cover 15 for covering the hand wheel 8 is attached to the side plate 1 and fixed thereto by nuts 17 threadably engaged with the stay bolts 12, a gear cover 16 for covering the reduction gear mechanism 11 is attached to the side plate 2 and also fixed thereto by the nuts 17.

The wheel cover 15 and the gear cover 16 are provided with radial bearings 18, 19 for the driving shaft 7 respectively, so that the driving shaft 7 can be supported rotatably at its axial opposite end portions by the covers





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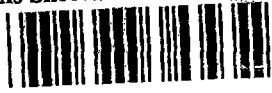
15, 16 through the bearings 18, 19 separately from the load sheave 3. Thereupon, a predetermined clearance is kept between the driving shaft 7 and a shaft bore of the load sheave 3 which is supported rotatably by the side plates 1, 2 through bearing 5, 6.

The hand chain 40, the hand wheel 8 and the transmission mechanism 10 constitute an actuating mechanism 20, and the embodiment illustrated in Figs. 1 and 2 is provided with an overload prevention mechanism 21.

The transmission mechanism 10 comprises a driven hub 22 joined to the drive shaft 7 so as not to rotate relatively thereto (threadably jointed to each other in Figs.), a driving member 23 threadably engaged with the driving shaft 7, a reverse prevention gear 24 interposed between the respective flange portions of the driven hub 22 and the driving member 23 and supported rotatably by the driven hub 22 and lining plates 25, 26 interposed respectively between the driven hub 22 and the reverse prevention gear 24 and between the reverse prevention gear 24 and the driving member 23. A reverse prevention pawl 27 meshed with the reverse prevention gear 24 is swingably mounted to the side plate 1 through a pawl shaft 28. This reverse prevention pawl 27, the reverse prevention gear 24, the driven hub 22, the driving member 23 and the lining plates 25, 26 constitute the mechanical brake 9.

The overload prevention mechanism 21 supports the hand wheel 8 by a cylindrical boss portion 23a of the driving

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member 23 through a one-way clutch 29 allowing to rotate in the normal driving direction, has a lining plate 30 disposed between the flange portion of the driving member 23 and a boss portion of the hand wheel 8, and also has a lining plate 31 and a press plate 32 rotatable together with the cylindrical boss portion 23a and a resilient member 33 comprising an initially coned disc spring fitted in order onto the cylindrical boss portion 23a of the driving member 23 outside the hand wheel 8, and an urging force setting adjuster 34 threadably engaged with an end of the boss portion 23a outside the resilient member 33 to optionally set a slipping load of the hand wheel 8 relative to the driving member 23 by adjusting an urging force of the resilient member 33.

Further, the reduction gear mechanism 11 comprises a first gear 35 formed integrally with a shaft end of the driving shaft 7, a pair of second gears 37, 37 supported by intermediate shafts 36, 36 respectively so as to mesh with the first gear 35, a pair of third gears 38, 38 provided in the intermediate shafts 36, 36 and a fourth gear 39 connected to an extended portion of the load sheave 3 so as to mesh with the third gears 38, 38.

Incidentally, in Fig. 1, the symbol 41 designates a wheel stopping member interposed between an axial end face of the driving member 23 and an outer ring 18a of the radial bearing 18 to restrain an axial outward shift of the hand wheel 8 through the driving member 23, the symbol 42 does a

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pawl spring adapted to urge the reverse prevention pawl 27 toward a reverse prevention gear 24, and the symbol 46 does a chain kicker.

Thus, in the above mentioned construction, when the hand wheel 8 is actuated in the normal direction by operating the hand chain, the driving shaft 7 is driven through the transmission mechanism 10 having the overload prevention mechanism 21 and the mechanical brake 9 so that the driving force is transmitted to the load sheave 3 through the reduction gear mechanism 11 to rotate the load sheave 3. Thereupon, the load side portion of the load chain 4 looped around the load sheave 3, namely the load side portion having a hook attached to its leading end thereof for hanging a cargo can be wound up to lift the cargo.

When a load larger than the slipping load set by the adjuster 34 of the overload prevention mechanism 21 acts on the load side portion of the load chain 4 at the time of lifting the cargo, the hand wheel 8 slips relative to the driving member 23 so that the cargo lifting after that is stopped. Thereupon, a level of the cargo lifted in that way is held by an action of the mechanical brake 9.

When the lifted cargo is lowered, the hand chain 40 is operated to actuate the hand wheel 8 in the reverse direction. Thereupon, the driving member 23 is retreated due to a screw effect by reversely actuating the hand wheel 8, so that the load sheave 3 is rotated reversely by alternately repeating an action and an inaction of the



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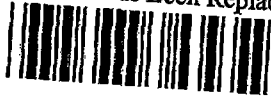
mechanical brake 9 to carry out the cargo lowering gradually.

According to the present invention, in the manual chain block having the above-mentioned constitution, lower opening edges of introducing openings 15b, 15c for the hand chain 40 formed in the wheel cover 15 are defined by using a cover holding member 50, and the lower portion of the wheel cover 15 is fixedly secured onto the side plate 1 by the stay bolt 12 through the cover holding member 50.

When explaining more in detail, as shown in Figs. 2 and 7, the wheel cover 15 is located radially outside the outer peripheral surface of the hand wheel 8 and so configured as to have an upper side portion 15d with a cover side wall 15a having opposite side extended to its turned down portions toward its left and right sides at a predetermined height, left and right side portions 15e, 15f having the introducing openings 15b, 15c for the hand chain 40 and configured along the outer peripheral portion of the hand wheel 8, and a lower tightened portion 15h joined to the lower portions of those side portions 15e, 15f with protruding radially outward relative to the outer peripheral portion of the hand wheel 8 so as to have a bolt passing opening 15g for the stay bolt 12 and adapted to sit on a seat 53 of the cover holding member 50 and to be tightened together therewith by the stay bolt 12.

In the lower tightened portion 15h of the wheel cover 15 there is provided a short cover engaging piece 15i joined

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to the side portions 15e, 15f having the introducing openings 15b, 15c formed therein and having an arcuate cross-section, and in the center portion of the wheel cover 15 there is provided a concaved portion 15j for holding the radial bearing 18 therein. Outside the concaved portion 15j there are provided an annular rib 15k and reinforcement ribs 15r extending radially outward from the annular rib 15k.

The upper side portion 15d of the wheel cover 15 has passing openings 15m for the stay bolts 15 formed at its right and left corners together with upper tightened portions 15n, 15p for nuts 17 threadably engaged with the stay bolts 12 so as to be fixed at three locations together with the lower tightened portion 15h provided in the lower portion of the wheel cover 15 when the nuts 17 are tightened relative to the stay bolts. Between the corners of the upper side portion 15d there is provided a reinforcement rib 15t running between the upper tightened portions 15n, 15p, and along the side edge portions of the respective side portions 15e, 15f there are provided reinforcement ribs 15x, 15y running between the upper tightened portions 15n, 15p and the lower tightened portion 15h. These reinforcement ribs 15x, 15y can have opened leading ends as shown in Fig. 4, but preferably have closed leading end portions in a pipe-like configuration as shown in Fig. 14.

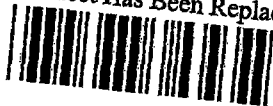
As shown in Figs. 8 through 10, the cover holding member 50 is formed like a stay having side surfaces 51, 52 which



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define the lower opening edges of the introducing openings 15b, 15c and is provided at its lengthwise one end portion with a cover receiving portion 55 having a seat 53 onto which the inner surface of the lower tightened portion 15h of the wheel cover 15 sits and a curved engagement surface 54 with which the inner surface of the engaging piece 15i engages and provided with at its lengthwise other end portion with a pair of angular lugs 56, 57 adapted to fit into a pair of angular fitting openings 43 formed in the first side plate 1. A passing opening 53a through which the stay bolt 12 passes is formed in the seat 53, so that the cover holding member 50 can be fixedly secured to the first side plate 1 together with the cover 15 by tightening the nuts 17 threadably engaged with the projecting portions of the stay bolts 12 running along the insides of the side surfaces 51, 52 and projected from the passing opening 53a and the passing opening 15g of the tightened portion 15h respectively.

Thus, the cover holding member 50 can be fixedly secured to the first side plate 1 together with the wheel cover 15 by tightening the nut 17 threadably engaged with the stay bolt 12 at the lower side portion of the wheel cover 15 with the inner surface of the lower tightened portion 15h being seated at the seat 53 of the cover holding member 50 and the inner surface of the cover engaging piece 15i being engaged with the engagement surface of the cover receiving portion 55. Also by tightening the nuts 17 threadably engaged with



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the stay bolts 12, the upper side portion 15d of the wheel cover 15 can be fixedly secured to the first side plate 1 with the end faces of the cover side wall 15a being kept in contact with the first side plate 1 and the hand chain guides 44. 44 to be explained later interposed insides of the upper tightened portions 15n, 15p as shown in Figs. 2 and 6, so that the end faces of the cover side wall 15a are pushed against the first side plate 1 and the hand chain guides 44. 44 are fixedly secured between the inner surfaces of the upper tightened portions 15n, 15p and the first side plate 1.

Accordingly, the wheel cover 15 can be stably secured to the first side plate 1 by three pieces of stay bolts 12 as well as the introducing openings 15b, 15c whose lower opening edges are defined by the side surfaces 51, 52 of the cover holding member 50 can be provided on the opposite left and right sides of the wheel cover 15 under that secured condition.

Since the cover holding member 50 is made from another member separate from the wheel cover 15 and formed like a stay as shown in Fig. 8 to form the lower opening edges of the introducing openings 15b, 15c by its side surfaces 51, 52 in that way, it is possible to obtain a sufficient strength in comparison with a conventional embodiment which has the introducing openings formed by the cover side walls.

Thereupon, since the cover holding member 50 can have the sufficient strength as mentioned above, it is possible



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to space apart the positions of the lower opening edges from the introducing passages 60 of the hand chain 40 by narrowing a space between the side surfaces 51, 52 defining the lower opening edges, to decrease the chances of contact with the hand chain 40 by locating the side surfaces 51, 52 at the positions spaced apart from the introducing passages 60 and to decrease the generation of the contact noises and improve the durability. Further, since the cover holding member 50 can be formed separately from the wheel cover 15 made of the steel plate, it can be made of a vibration proof material such as cast iron, aluminum, synthetic resin and iron. Therefore, silence effect can be attained by the manufacturing from those materials. Thereupon, even when the hand chain 40 is brought into contact therewith, it is possible to restrain the generation of peculiar noises and at the same time to accomplish the decrease of weight by using the light material such as aluminum.

In the above-mentioned embodiment, by disposing the short cover engaging piece 15i of the arcuate cross section in the lower portion of the wheel cover 15 and making the engaging piece 15i engage with the engagement surface 54 of the cover receiving portion 55 of the cover holding member 50 the cover engaging member 15i can hold the cover receiving portion 55. Therefore, even when the impact is imposed to the wheel cover 15 from outside, it is possible to decrease the deformation of the wheel cover 15 due to the reinforcement attained by being held onto the cover



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receiving portion 55 and to stably fix the wheel cover 15 onto the first side plate 1 without any shifting of its position.

Further, in the above constitution, by interposing the vibration absorbing material 58 such as a rubber packing between the seat 53 of the cover receiving portion 55 and the inner surface of the tightened portion 15h adapted to sit on the seat 53 it is possible to effectively prevent the peculiar noises from being generated by the resonance of the cover 15 to which vibrations are transmitted when the hand chain 40 is brought into contact with the cover holding member 50.

Since the configurations of the side portions 15e, 15f of the wheel cover 15 run along the outer periphery of the hand wheel 8 as well as the lower tightened portion 15h is protruded radially downward outwardly relative to these side portions 15e, 15f, it is possible to decrease the chances of contact of the hand chain 40 with the opening edges of the introducing openings 15b, 15c formed in the side portions 15e, 15f to decrease the generation of unpleasant peculiar noises even when the hand chain 40 is operated slantly toward the axial direction of the hand wheel 8.

Next, the hand chain guide 44 will be explained hereinafter.

As shown in Figs. 2 and 3 and Figs. 6 and 7, the hand chain guide 44 comprises an attachment portion 44a having a bolt passing opening 44i, and interposed between the



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tightened portion 15n, 15p of the wheel cover 15 and the stay bolt 12, a held portion 44b adapted to be engaged and held by the side plate 1 and a guide portion 44c formed between the attachment portion 44a and the held portion 44b and facing the hand wheel 8 to guide the hand chain 40 looped around the hand wheel 8 and is provided separately from the wheel cover 15. The hand chain guides 44 are fixedly secured between the side plate 1 and the tightened portions 15n, 15p of the wheel cover 15 by tightening the nuts 17 relative to the stay bolts 12.

When further explaining in detail, the hand chain guide 44 is generally formed of a thick steel plate. As shown in Figs. 11 and 12, an outer surface of the attachment portion 44a is so formed as to coincide with the inner surface of the cover side wall 15a at the tightened portion 15n, 15p of the wheel cover 15. When the attachment portion 44a is interposed between the tightened portions 15n, 15p and a stepped portion 12a of the stay bolt 12, the outer surface of the attachment portion 44a is brought into contact with the inner surface of the cover side wall 15a as shown in Fig. 12 or comes so near as to contact therewith. The guide portion 44c comprises swelled out portions 44d, 44e swelled out toward wheel flanges 8a, 8b of the hand wheel 8 to oppose thereto respectively and a concaved portion 44f concaved relative to these swelled out portions 44d, 44e. As shown in Fig. 3, the swelled out portions 44d, 44e are opposed to the wheel flanges 8a, 8b with keeping a smaller



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gap than a width of the hand chain 40 to define a guide passage 45 for the hand chain 40 together with the concaved portion 44f between the the wheel flanges 8a, 8b.

Further, the held portion 44b is joined to the swelled portion 44e with being provided at its end face with a lug 44g protruded toward the side plate 1. As a fitting hole 46 for receiving the lug 44g is formed in the side plate 1 as shown in Fig. 3, the lug 44g can be fitted into the fitting hole 46 to hold the held portion 44b by the engagement with the side plate 1.

Incidentally, it is preferable to keep the outer surface of the concaved portion 44f of the guide portion 44c in contact with the stay bolt 12, but a small gap may be provided therebetween. Further, the end face of the held portion 44b is preferably brought into pressed contact with the side plate 1 by tightening the nuts 17 relative to the stay bolt 12, but a small gap may exist therebetween in the case of engaging and holding by the lug 44g.

As mentioned above, since the hand chain guides 44, 44 are fixedly secured at the tightened portions 15n, 15p together with the cover holding member 50 by tightening the nuts 17 relative to the stay bolts 12, the hand chain 40 can be guided suitably by these hand chain guides 44, 44 allowing the hand chain 40 to be smoothly operated. Further, since each hand chain guide 44 is interposed between the inner surface of the tightened portion 15n, 15p and the stepped portion 12a of the stay bolt 12 so that its



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outer surface is brought into contact with the cover side wall 15a at the tightened portions 15n, 15p or comes near thereto as well as the held portion 44b is engaged and held by the side plate 1. a box-like section can be defined between the cover side wall 15a and the side plate 1 to strongly reinforce the wheel cover 15. Therefore, even when the impact is imposed thereto from outside, it can be received by the stay bolt 12 having a large rigidity through the attachment portion 44a to effectively restrain the deformation of the wheel cover 15.

Thereupon, since the attachment portions 44a are interposed between the tightened portions 15n, 15p and the stepped portions 12a of the stay bolts 12 as well as the lug 44 is merely fitted into the fitting hole 46 of the side plate 1 and held by the engagement therebetween, it is possible to attain the above-mentioned sufficient reinforcement and to simplify the mounting. Further, since the hand chain guides 44 are provided separately from the wheel cover 15, it is possible to improve the processability of the wheel cover 15. Since the hand chain guide 44 is a small component part, its manufacturing accuracy can be improved. Furthermore, since the attachment portions 44a are interposed and fixed between the tightened portions 15n, 15p and the stepped portions 12a of the stay bolts 12, the assembling accuracy can be improved as well as shifts of their positions can be avoided.

Further, by forming the hand chain guide 44 from the



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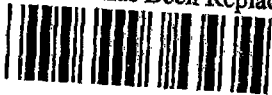
vibration proof material such as cast iron, aluminum and synthetic resin besides being formed of the thick steel plate it is possible to effectively restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith.

As shown in Fig. 13, by coating the whole surface of the hand chain guide 44 or at least the surface thereof facing the hand wheel 8 with the synthetic resin and the like so as to form a vibration proof layer 48 it is possible to effectively restrain the generation of peculiar noises caused by the contact with the hand chain guide 44.

Further, as shown in Fig. 3, by interposing a vibration absorbing material 49 such as the rubber packing between the attachment portion 44a and the tightened portion 15n, 15p it is possible to prevent unpleasant peculiar noises from being generated by the resonance of the wheel cover 15 even when the hand chain 40 is brought into contact with the hand chain guide 44.

The hand chain guide 44 can be readily mounted by interposing the attachment portion 44a between the tightened portion 15n, 15p and the stay bolt 12 and fitting the lug 44g of the held portion 44b into the fitting hole 46 of the side plate 1. But, its mountability can be further improved by fixing the attachment portion 44a to the tightened portion 15n, 15p mainly by means of a spot welding.

Incidentally, in the above-mentioned embodiment, though the overload prevention mechanism 21 is assembled in the



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manual actuating mechanism 20, this overload prevention mechanism 21 is not always needed and also the reduction gear mechanism 11 may be omitted.

Further, though the driving shaft 7 is supported at its axial opposite end portions by the radial bearings 18, 19 provided in the wheel cover 15 and the gear cover 16, it may be supported by the load sheave 3 or supported at its axial one end portion by one of the wheel cover 15 and the gear cover 16 and at its intermediate shaft portion by the load sheave 3.

Next, functions and advantages of the present invention as constituted above will be explained hereinafter.

Since the cover holding member 50 is provided separately from the wheel cover 15 so that the wheel cover 15 can be received by the cover receiving portion 55 of the cover holding member 50 and fixed by being tightened together with the cover 15 by the stay bolts 12, an enough strength can be obtained in comparison with the conventional embodiment in which the introducing openings are formed by the cover side wall, the durable strength of the lower opening edge of the introducing opening can be increased and the strength of the cover holding member 50 can be obtained sufficiently.



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Thereupon, the locations of the lower opening edges can be made remote from the introducing passages 60 of the hand chain 40 passing through the introducing openings by narrowing a width between the side surfaces 51, 52 defining the lower opening edges of the introducing openings. Accordingly, it is possible to decrease the chances of contact with the hand chain, to decrease the chances of generation of noises and to improve the durability. Further, since the cover holding member 50 is formed as a separate member from the wheel cover 15, it is possible to restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith and also to decrease the weight in case that it is formed from a light material such as aluminum.

Since the respective side surfaces 51, 52 of the cover holding member 50 are disposed at the locations remote from the introducing passages 60 of the hand chain 40, even when the whole of the chain block is made to jump by an abrupt and violent operation of the hand chain 40 or inclined by an effect of a large load, it is possible to decrease the chances of contact of the hand chain 40 with the side surfaces 51, 52 to improve its silencing effect and to improve the durability.

Further, since the cover holding member 50 is formed from the vibration proof material, it is possible to effectively



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restrain the generation of unpleasant peculiar noises even when the hand chain 40 is brought into contact therewith.

Since the cover engaging piece 15i is disposed in the wheel cover 15 and the engagement surface 54 is disposed in the cover holding member 50, the cover engaging piece 15i can hold the cover holding member 50. Therefore, when an impact is imposed to the wheel cover 15 from outside, it becomes possible to decrease a deformation of the cover 15 due to the reinforcement attained by holding the cover receiving portion 55 by the cover engaging piece 15i and to fix the cover 15 onto the side plate 1 stably without causing a shift of its position.

Further, since the seat 53 is formed in the cover receiving portion 55 and the vibration absorbing material 58 such as a rubber packing is interposed between the seat 53 and the inner surface of the wheel cover 15, even though the hand chain 40 comes into contact with the cover holding member 50, it becomes possible to effectively prevent large abnormal noises from being generated by a resonance of the wheel cover 15 caused by contact vibrations transmitted to the cover 15 and to improve a sound proof effect.

Since the left and right side portions 15e, 15f of the wheel cover 15 provided with the introducing openings 15b, 15c is so formed as to extend along the outer peripheral portion of



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the hand wheel 8 and the lower tightened portion 15h is so formed as to protrude radially outward relative to the outer peripheral portion of the hand wheel 8, even though the hand chain 40 is operated slantly relative to the axial direction of the hand wheel 8, it is possible to decrease such a chance that the hand chain 40 is brought into contact with opening edges of the introducing openings 15b, 15c formed in the side portions 15e, 15f and to restrain the generation of unpleasant abnormal noises.

Since the hand chain guides 44 comprise the attachment portions 44a, the held portions 44b and the guide portions 44c with the attachment portions 44a being interposed between the tightened portions of the wheel cover 15 by the stay bolt 12 and the stay bolts 12 and the held portion 44b being adapted to be engaged and held by the side plate 1, they can be strongly fixed between the tightened portions of the wheel cover 15 and the side plate 1 without causing a shift of their positions by tightening the stay bolts 12 without welding. Owing to that fixing therebetween without any welding, it becomes possible to improve the assembling capability. Further, since the hand chain guide 44 is formed separately from the wheel cover 15 and fixed therebetween as mentioned above, it is possible to improve the workability of the wheel cover 15 and also to improve the processing accuracy. Furthermore, since the attachment portions 44a are interposed between the tightened portions



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and the stay bolts 12 and fixed therebetween. it is possible to improve the assembling accuracy without causing a shift of the assembly position.

In addition thereto, since the hand chain guide 44 has the attachment portion 44a interposed between the tightened portion and the stay bolt 12 and the held portion 44b held and engaged with the side plate 1, it is possible to define a box-like section together with the cover side wall 15a of the wheel cover 15 and the side plate 1, so that the wheel cover 15 can be reinforced sufficiently by the hand chain guides 44.

Since the outer surface of the attachment portion 44a is so formed as to coincide with the inner surface of the cover side wall 15a, the outer surface of the attachment portion 44a is brought into contact with the inner surface of the cover side wall 15a or comes near thereto. Therefore, when an impact is imposed thereon from outside, the cover side wall 15a is going to deform inward. But, that impact is received by the stay bolts of the high rigidity through the attachment portions 44a of the hand chain guides 44 to restrain a deformation of the wheel cover 15 effectively, so that a reinforcement function for the wheel cover 15 can be further improved.

Since the guide passage 45 is formed in the guide portion 44c, even the hand chain 40 jumps within the wheel cover 15.



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it is possible to prevent the chain 40 from getting out of the hand wheel 8 and it becomes possible to carry out a smooth operation of the hand chain 40.

Since the hand chain guide 44 is formed from a vibration proof material, even when the hand chain 40 is brought into contact with the hand chain guides 44, it is possible to restrain the generation of peculiar noises. According to the invention as set forth in claim 11, since the vibration proof layer 48 is formed on the guide portion 44c of the hand chain guide 44, similarly to the hand chain guide 44 formed from the vibration proof material, it is possible to restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith.

Since the vibration absorbing material 49 such as the rubber packing is interposed between the attachment portion 44a and the tightened portion of the wheel cover 15, even when the hand chain is brought into contact with the hand chain guide 44, it is possible to prevent unpleasant peculiar noises from being generated by the resonance of the wheel cover 15. Further, according to the invention as set forth in claim 13, since the attachment portions 44a of the hand chain guides 44 are fixed to the tightened portions of the wheel cover 15 by means of a spot welding, it is possible to improve the interposing workability for interposing the hand chain guides 44 between the wheel cover 15 and the side



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plate 1. Thereupon, since that fixation is not intended to reinforce the wheel cover 15 by the hand chain guides 44 but merely intended to connect them for preventing the separation therebetween, it is possible to not only improve the mountability but also reinforce the wheel cover 15 sufficiently by the above mentioned fixation.

Since the held portion 44b is provided with the lug 44g so that the lug 44g can be fitted into the fitting hole 46 formed in the side plate 1 to hold the held portion 44b by engagement with the side plate 1, the hand chain guide 44 can be strongly secured and held by the side plate 1. Thereupon, the box-like section defined by the side wall 15a, the side plate 1 and the hand chain guide 44 can be made stronger so that the reinforcement of the wheel cover 15 can be accomplished more securely by that box-like section.

It will be understood that the above description has been given with reference to preferred embodiments of the invention. However, various modifications may be made within the scope of the invention as defined by the following claims.



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What is claimed is:

1. A manual chain block including a pair of side plates (1,2), a load sheave (3) which is supported rotatably between said side plates and around which a load chain is looped, an actuating mechanism (20) which is disposed outside one (1) of said side plates and has a hand wheel (8) for actuating said load sheave (3) and a wheel cover (15) which is attached to the one of said side plates (1) to cover said actuating mechanism (20) and has introducing openings (15b, 15c) for a hand chain (40) looped around said hand wheel (8), wherein between said introducing openings (15b, 15c) there is provided a cover holding member (50) having side surfaces (51, 52) which face introducing passages (60) for said hand chain (40) and define lower opening edges of said introducing openings (15b, 15c) and a cover receiving portion (55) for receiving said wheel cover (15) located between the introducing openings (15b, 15c) and said cover holding member (50) is tightened together with said cover (15) to said side plate (1) by stay bolt means (12).
2. A manual chain block as set forth in claim 1, wherein said respective side surfaces (51, 52) are disposed at locations spaced apart from said introducing passages (60) for said hand chain (40).
3. A manual chain block as set forth in claim 1, wherein said cover holding member (50) is formed from a vibration proof material.





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4. A manual chain block as set forth in claim 1, wherein said wheel cover has a short cover engaging piece (15i) having an arcuate cross-section disposed between the lower portions of said introducing openings (15b, 15c) for the hand chain, and an engaging surface (54) adapted to engage with the inner surface of said cover engaging piece (15i) is formed in the cover receiving portion of said cover holding member (50).

5. A manual chain block as set forth in claim 1, wherein said cover receiving portion has a seat (53) onto which the inner surface of said wheel cover (15) sits, and a vibration absorbing material (58) is interposed between the seat (53) and the inner surface of said wheel cover (15).

6. A manual chain block as set forth in claim 1, wherein said wheel cover (15) is located radially outside an outer peripheral portion of said hand wheel (8) and comprises an upper side portion (15d) having a cover side wall (15a) extending to its turned down portions toward its left and right sides, left and right side portions (15e, 15f) having the introducing openings (15b, 15c) for the hand chain and extending along the outer peripheral portion of said hand wheel (8) and a lower tightened portion (15h) joined to the lower portions of said side portions (15e, 15f) with protruding radially outward relative to the outer peripheral portion of said hand wheel (8) and adapted to sit on said cover holding member (50) and to be tightened together with said cover holding member by the stay bolt means (12).



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7. A manual chain block as set forth in claim 1, wherein said hand chain guide (44) comprises an attachment portion (44a) interposed between a tightened portion of said wheel cover (15) by the stay bolt (12) and the stay bolt (12), a held portion (44b) adapted to be engaged and held by said side plate (1), a guide portion (44c) formed between said attachment portion (44a) and said held portion (44b) and facing said hand wheel (8) to guide said hand chain (40) looped around said hand wheel (8), so that the hand chain guides (44) can be secured between said side plate (1) and the tightened portions of said wheel cover (15) by tightening the stay bolts (12).

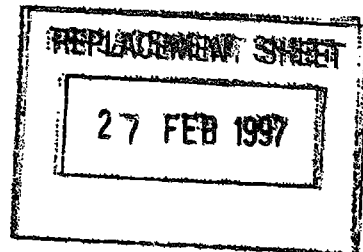
8. A manual chain block as set forth in claim 7, wherein the attachment portion of said hand chain guide has an outer surface (44a) which coincides with the inner surface of said cover side wall (15a) of the tightened portion of the wheel cover (15).

9. A manual chain block as set forth in claim 7, wherein the guide portion (44c) of said hand chain guide (44) has swelled-out portions (44d, 44e) swelled out towards wheel flanges (8a, 8b) of said hand wheel (8) respectively to oppose thereto, and these swelled-out portions (44d, 44e) are opposed to the wheel flanges (8a) with keeping a smaller gap than a width of the hand chain (40) to define a guide passage (45) for the hand chain (40) together with the wheel flanges (8a, 8b) therebetween.

10. A manual chain block as set forth in claim 7, wherein said hand chain guide (44) is formed from a vibration proof



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material.

11. A manual chain block as set forth in claim 7, wherein a vibration proof layer (48) is formed on the surface of the guide portion (44c) of said hand chain guide (44) at least on the side of hand wheel (8).

12. A manual chain block as set forth in claim 7, wherein a vibration absorbing material (49) is interposed between the attachment portion (44a) of said hand chain guide (44) and the tightened portion of said wheel cover (15).

13. A manual chain block as set forth in claim 7, wherein the attachment portion (44a) of said hand chain guide (44) is fixed to the tightened portion of said wheel cover (15).

14. A manual chain block as set forth in claim 7, wherein the held portion (44b) of said hand chain guide (44) is provided with a lug (44g) protruded from its end portion, and said side plate (1) is provided with a fitting hole (46) for receiving said lug (44g).

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MANUAL CHAIN BLOCKABSTRACT

The invention relates to a manual chain block in which there is provided a cover holding member 50 having side surfaces 51, 52 which define lower opening edges of introducing openings 15b, 15c for a hand chain 40 and a cover receiving portion 55 which is located between the introducing openings 15b, 15c to receive the wheel cover 15. The cover holding member 50 is tightened by stay bolts 12 onto a side plate 1 together with the wheel cover 15.

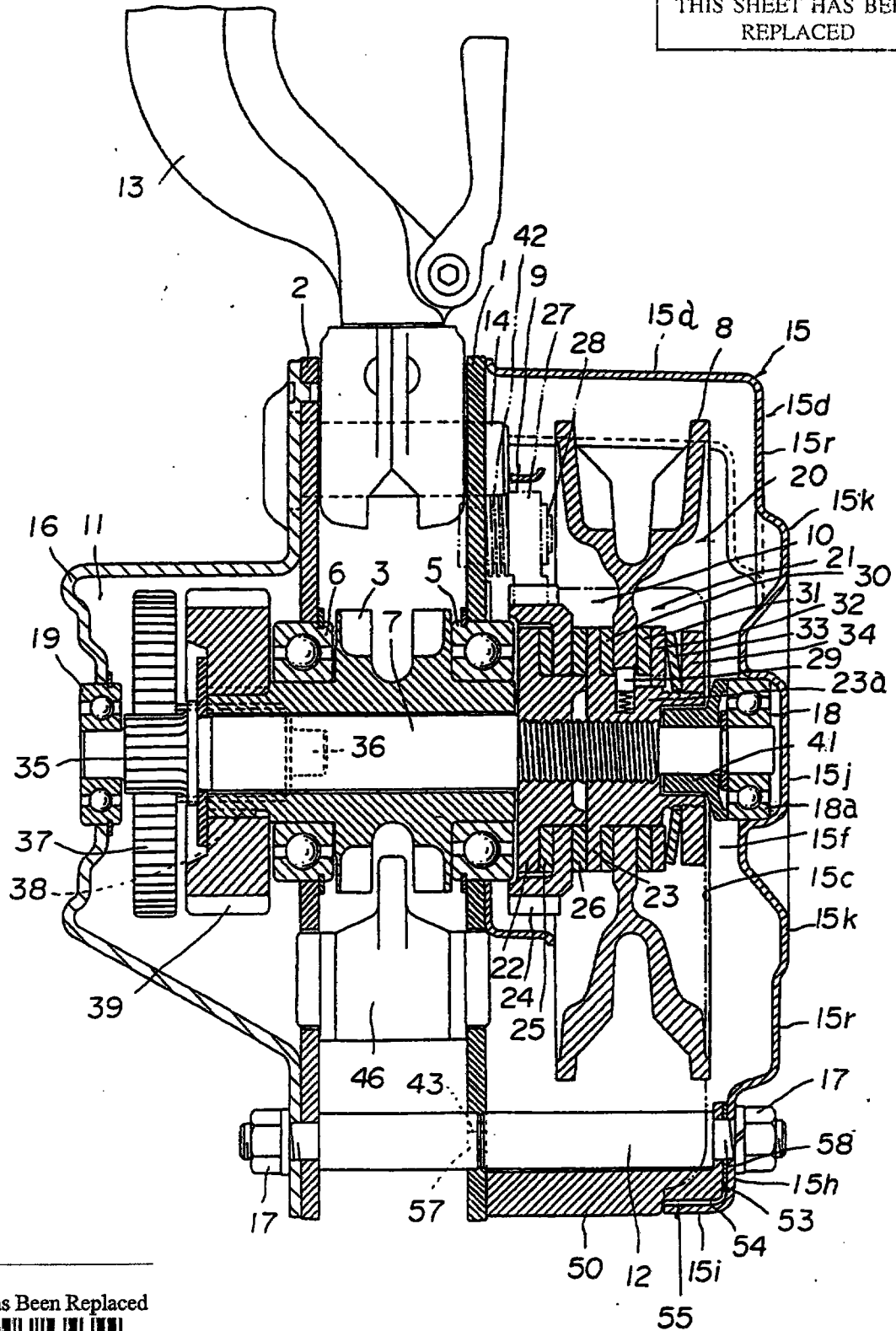
FIGURE 5.

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FIG. 1

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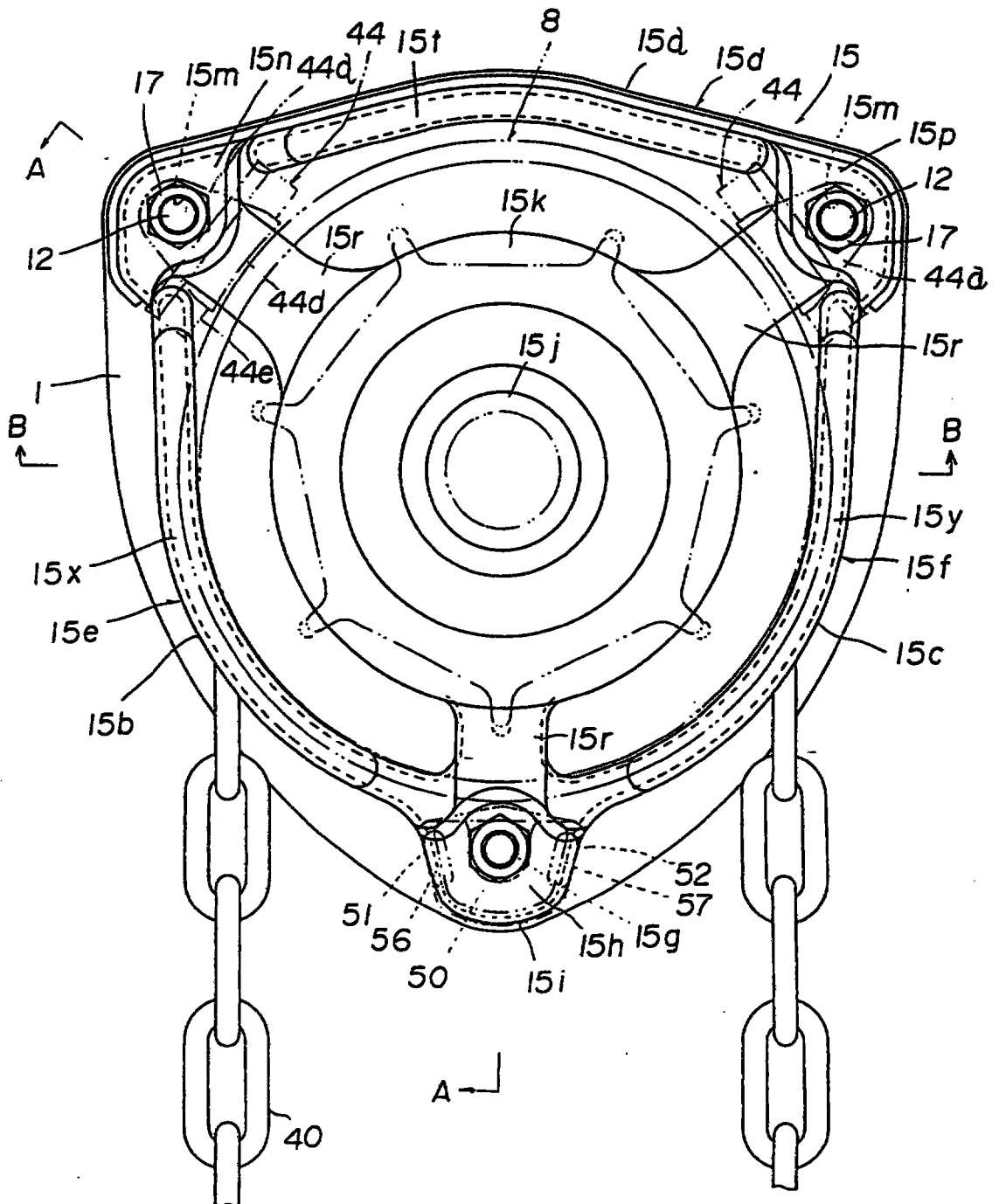
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FIG.2

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FIG.3

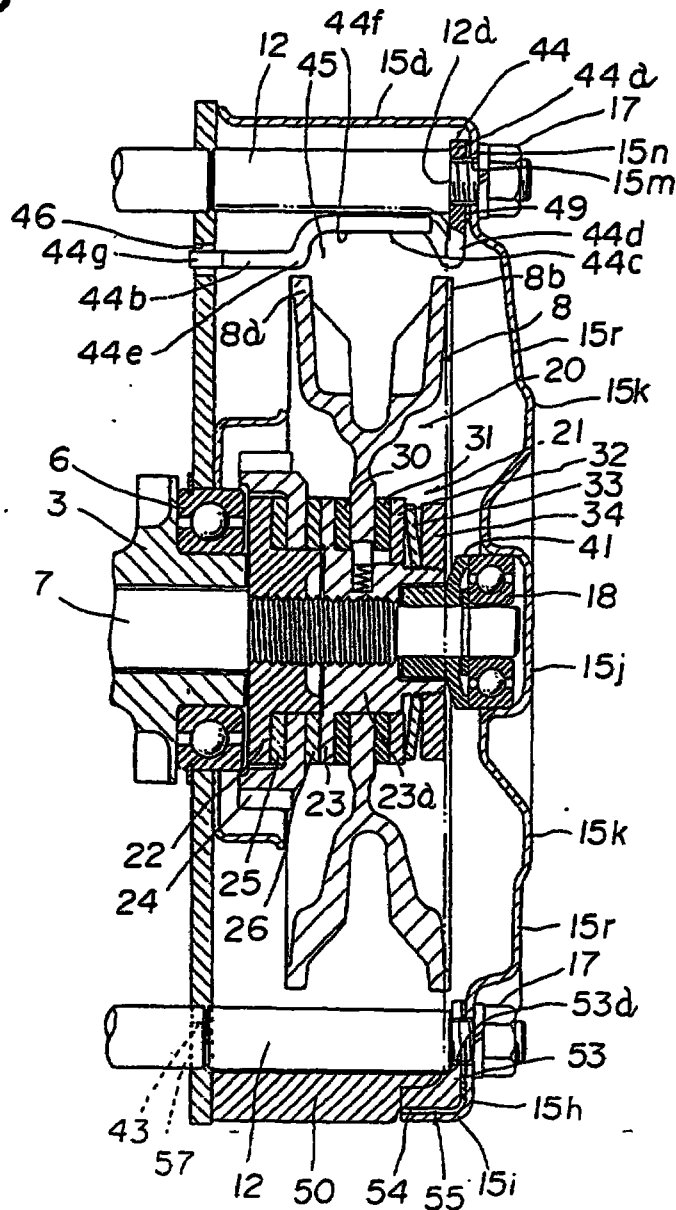
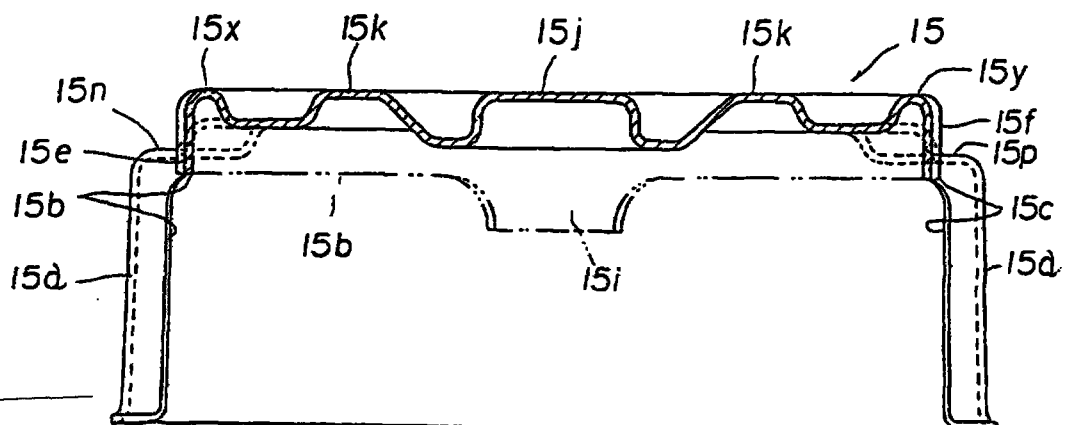


FIG.4



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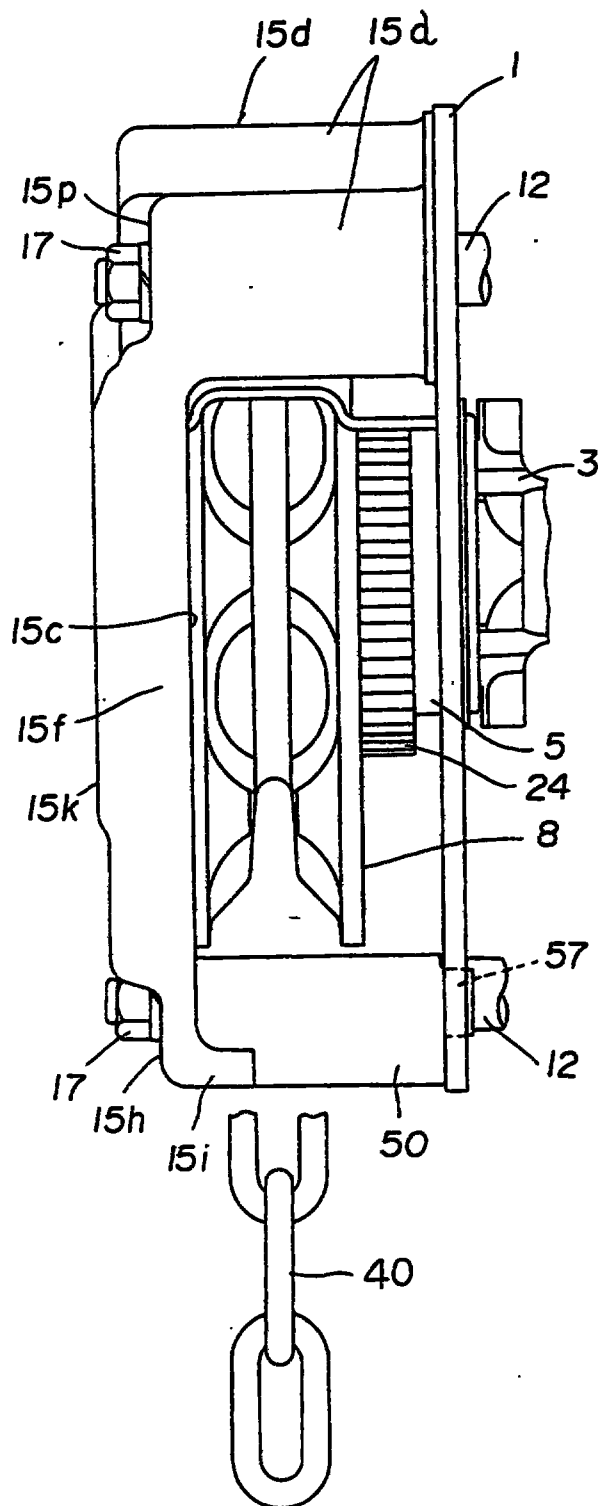


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FIG.5



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FIG.6

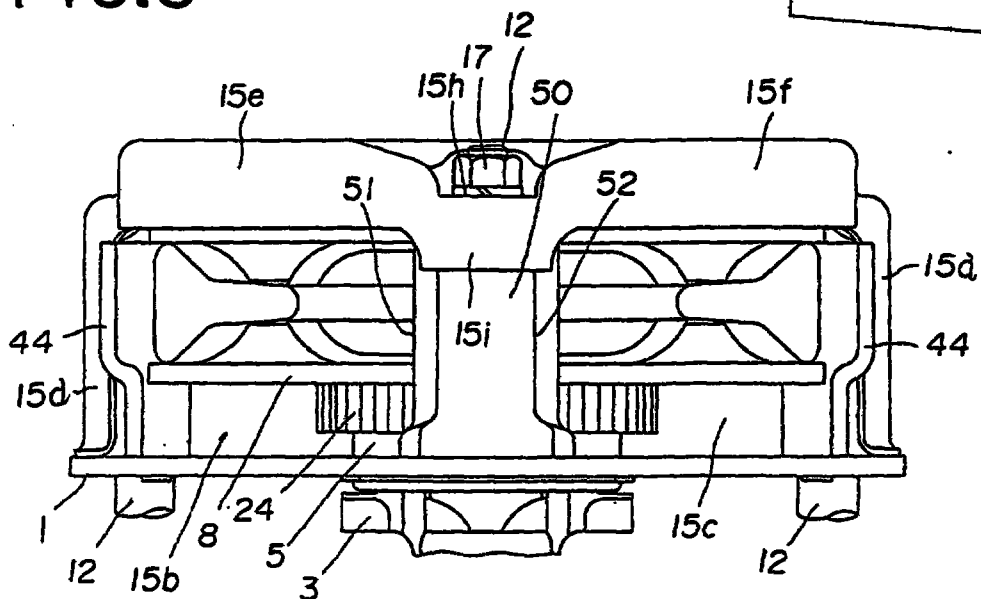
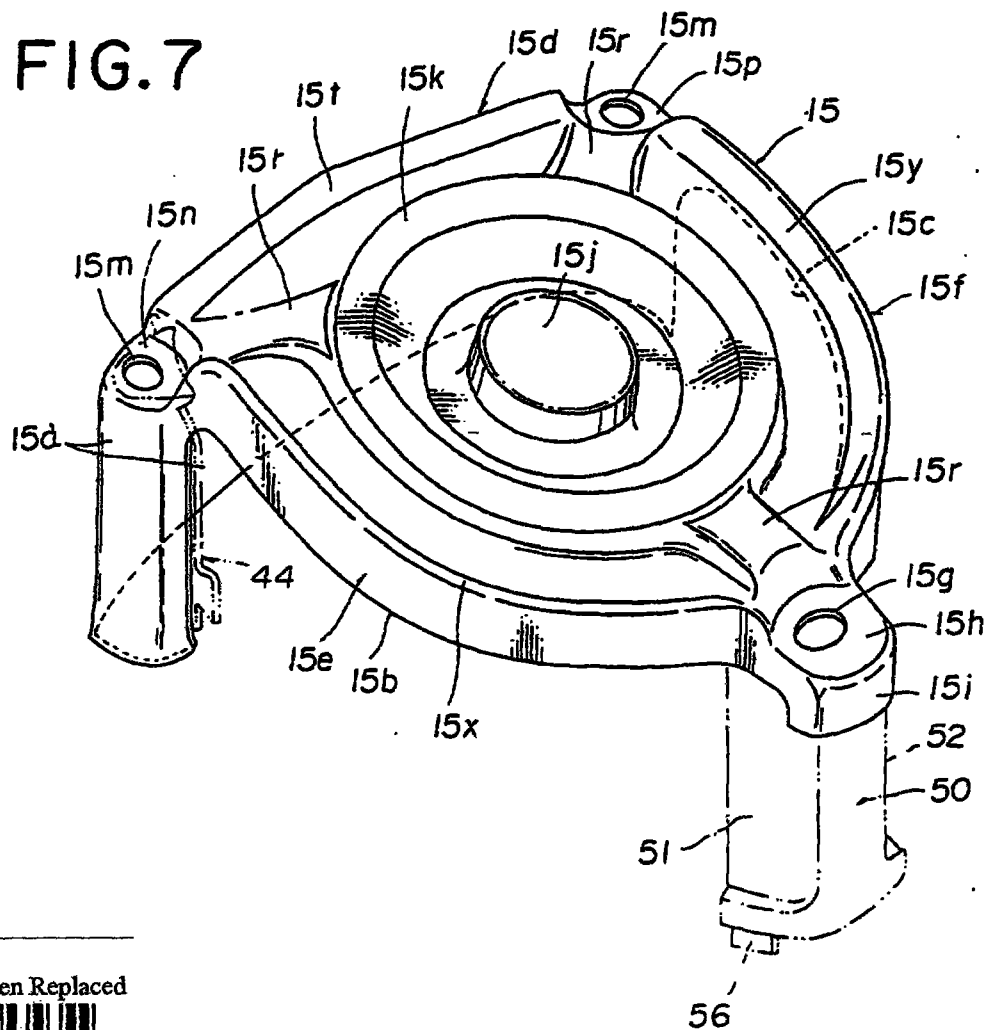


FIG.7



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FIG.8

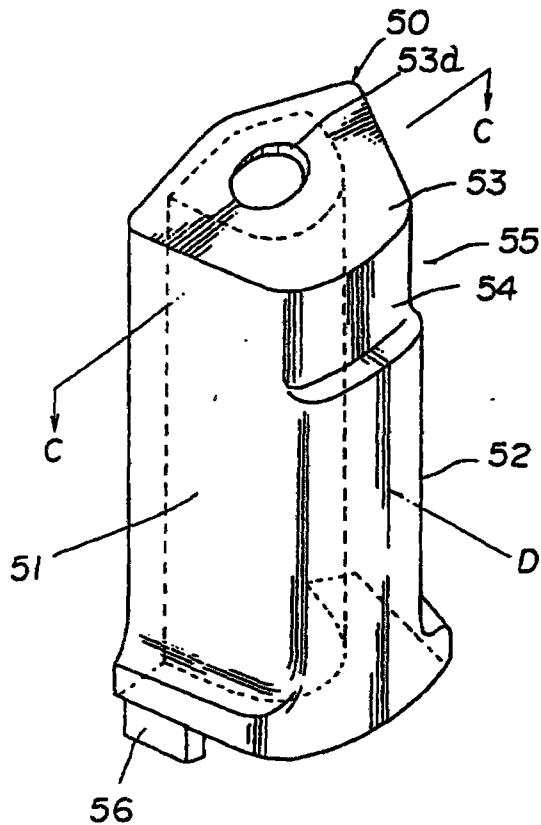


FIG.10

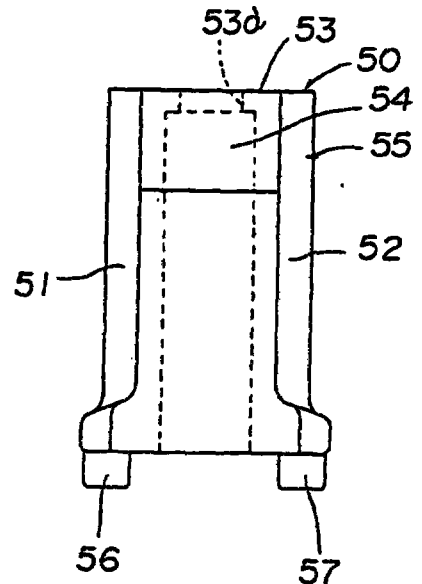


FIG.9

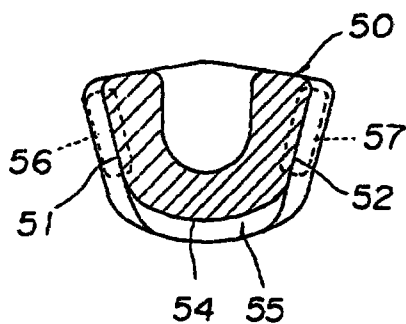
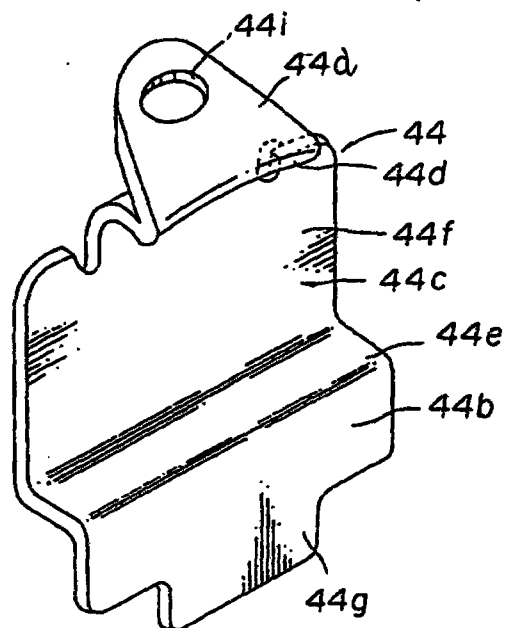


FIG.11



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FIG.12

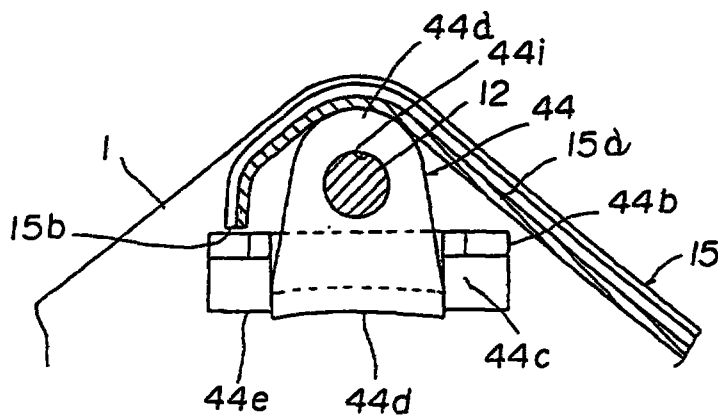


FIG.13

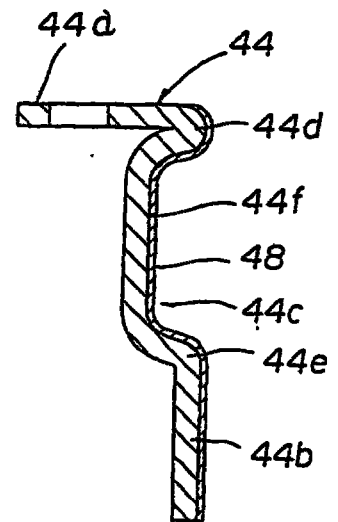
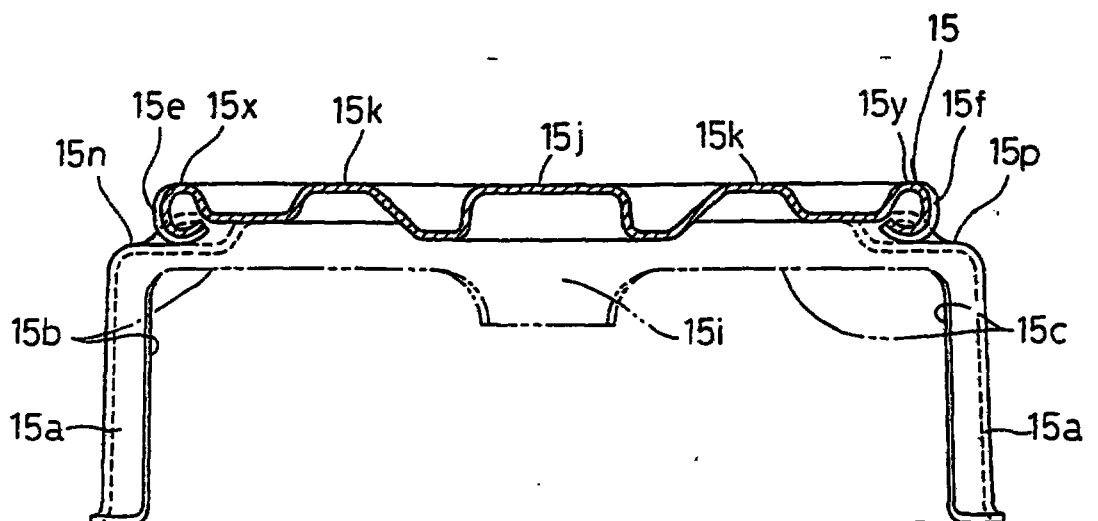


FIG.14



This Sheet Has Been Replaced



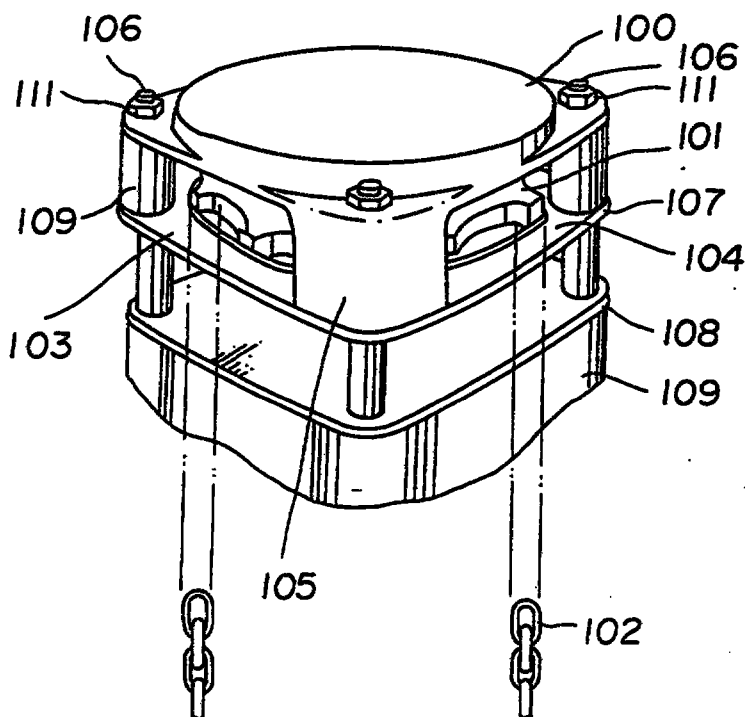
REPLACEMENT SHEET

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FIG.15

PRIOR ART



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REPLACEMENT SHEET

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MANUAL CHAIN BLOCK

The present invention relates to a manual chain block, and more specifically to a manual chain block having a load sheave supported rotatably between a pair of side plates so that the load sheave can be rotated by an actuating operation of an actuating mechanism having a hand wheel to wind up and unwind a load chain looped around the load sheave.

In a conventional manual chain block adapted to rotate a load sheave by operating an actuating mechanism having a hand wheel, for example as disclosed in the Japanese Utility Model Publication No. Sho. 40 (1965) - 8997, a wheel cover for covering the actuating mechanism is attached to an outside of a side plate.

As shown in Fig. 15, this wheel cover has introducing openings 103, 104 for a hand chain 102 looped around a hand wheel 101, formed in a lower portion of a cover body 100 on its opposite sides relative to the hand wheel 101 and a lower cover side wall 105 so formed integrally with the cover body 100 between those introducing openings 103, 104 as to define lower opening edges of the introducing openings 103, 104 with the cover body 100. The cover body 100 is fixedly secured by a plurality of stay bolts 106 to an

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actuating mechanism side side plate 107 of two side plates 107. 108 for supporting a load sheave (not illustrated).

Incidentally, in Fig. 15, the symbol 109 designates a gear cover and the symbol 110 does a hand chain guide.

But, the wheel cover having the above-mentioned constitution, is formed from a sheet metal, and the lower cover side wall 105 defining the lower opening edges of the introducing openings 103, 104 is formed integrally with the cover body 100 by a bending process. Thereupon, since the lower cover side wall 105 is formed of the sheet metal similarly to the cover body 100 and pushed and secured to the side plate 107 by tightening nuts 111 threadably engaged with the stay bolts 106, its strength is not enough. Therefore, the cover side wall 105 is formed comparatively wide as shown in Fig. 15.

While the opposite side edges of the cover side wall 105 define the introducing openings 103, 104, the cover side wall 105 is formed wide for attaining its sufficient strength. Accordingly, the opposite side edges of the cover side wall 105 come near to the introducing passages of the hand chain 102 passing through the introducing openings 103, 104. When the hand chain 102 is operated abruptly and violently to jump up or when a large load is imposed to the hand chain 102 to incline the whole of the chain block, the hand chain 102 is brought into contact with the edges of the cover side wall 105.

Thereby, there appear such problems that uncomfortable

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peculiar noises are generated and the cover side wall 105 is deformed by repetition of the contact for a long term use. There is also such a deficiency that the cover side wall 105 is deformed and damaged by an impact imposed from outside thereto so that the hand chain 102 is hindered from passing or peculiar noises are generated during a normal usage.

It is a principal object of the present invention to provide a manual chain block in which durable strength of lower opening edges of a passage openings for a hand chain in a wheel cover can be increased. the lower opening edges of the passage openings are made remote from an introducing passage for the hand chain to decrease chances of the contact with the hand chain and to decrease chances of generations of peculiar noises correspondingly. the durability can be improved and generations of peculiar noises can be restrained even when the hand chain is brought into contact with the wheel cover.

It is another object of the present invention to improve the workability for mounting a hand chain guide to an interior of a wheel cover. to reinforce the wheel cover sufficiently by a hand chain guide allowing to smoothly guide the hand chain to a hand wheel and to enable a user to smoothly carry out a pulling operation of the hand chain while processability of the wheel cover can be improved in spite of the improvement of the workability.

Thus, for accomplishing the above-mentioned objects. the

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invention resides in a manual chain block including, a load sheave which is supported rotatably between a pair of side plates and around which a load chain is looped, an actuating mechanism which is disposed outside one of the side plates and has a hand wheel for actuating the load sheave and a wheel cover which is attached to the one side plate to cover the actuating mechanism and has introducing openings for a hand chain looped around the hand wheel, wherein between the introducing openings there is provided a cover holding member having side surfaces which face introducing passages for the hand chain and define lower opening edges of the introducing openings and a cover receiving portion for receiving the wheel cover located between the introducing openings and the cover holding member is tightened together with the cover to the side plate by stay bolt means.

Conveniently, the respective side surfaces may be disposed at locations spaced apart from the introducing passages for the hand chain. Further, the cover holding member may be formed from a vibration proof material, for example such as cast iron, aluminum and synthetic resin.

Conveniently, between the introducing openings of the wheel cover for the hand chain there may be provided a short cover engaging piece having an arcuate cross-section, and an engaging surface adapted to engage with an inner surface of the cover engaging piece is formed

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in the cover receiving portion of the cover holding member. Further, a seat onto which the inner surface of the wheel cover sits may be formed in the cover receiving portion with a vibration absorbing material such as a rubber packing being interposed between the seat and the inner surface of the wheel cover.

Further, the wheel cover may be located radially outside an outer peripheral portion of the hand wheel and comprise an upper side portion having a cover side wall extending to its turned down portions toward its left and right sides, left and right side portions having the introducing openings and extending along the outer peripheral portion of the hand wheel and a lower tightened portion joined to the lower portions of those side portions with protruding radially outward relative to the outer peripheral portion of the hand wheel and adapted to sit on the cover holding member and to be tightened together therewith by the stay bolt.

The arrangement may include hand chain guides each of which comprises an attachment portion interposed between a tightened portion of the wheel cover by the stay bolt and the stay bolt, a held portion adapted to be engaged and held by the side plate, a guide portion formed between the attachment portion and the held portion and facing the hand wheel to guide the hand chain looped around the hand wheel, so that the hand chain guides can be secured between the

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side plate and the tightened portions of the wheel cover by tightening the stay bolts.

Further, an outer surface of the attachment portion of the hand chain guide may be so formed as to coincide with the inner surface of the cover side wall at the tightened portions of the wheel cover. The guide portion of the hand chain guide may have swelled-out portions, swelled out toward wheel flanges of the hand wheel respectively to oppose thereto, and these swelled-out portions are opposed to the wheel flanges with keeping a smaller gap than a width of the hand chain to define a guide passage for the hand chain together with the wheel flanges therebetween.

The hand chain guide may be formed from a vibration proof material such as cast iron and aluminum. A vibration proof layer may be formed on the guide portion of the hand chain guide at least on the side of hand wheel. Further, a vibration absorbing material may be interposed between the attachment portion of the hand chain guide and the tightened portion of the wheel cover.

Further, the attachment portion of the hand chain guide may be fixed to the tightened portion of the wheel cover mainly by means of the spot welding. Further, the held portion of the hand chain guide may be provided with a lug protruded from its end portion so that the lug can be fitted into a fitting hole formed in the side

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plate to hold the held portion by engagement with the side plate.

The above and other objects, advantages and features of the invention will become apparent when considered with the following description of several examples of apparatus according to the invention.

In the drawings:-

Fig. 1 is a vertical sectional view showing one embodiment of a manual chain block according to the present invention;

Fig. 2 is a front view showing a wheel cover portion;

Fig. 3 is a sectional view taken along the A-A line in Fig. 2;

Fig. 4 is a sectional view showing only the wheel cover and taken along the B-B line in Fig. 2;

Fig. 5 is a side view showing the wheel cover portion;

Fig. 6 is a bottom view showing the wheel cover portion;

Fig. 7 is a perspective view showing the wheel cover;

Fig. 8 is a perspective view showing a cover holding member;

Fig. 9 is a sectional view taken along the C-C line in Fig. 8;

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Fig. 10 is a view viewed along the arrow line D;

Fig. 11 is a perspective view showing a hand chain guide;

Fig. 12 is a plan view showing the hand chain guide;

Fig. 13 is a sectional view showing another embodiment of a hand chain guide;

Fig. 14 is a sectional view showing another embodiment of a wheel cover correspondingly to Fig. 4; and

Fig. 15 is an explanatory view showing a conventional embodiment.

A manual chain block illustrated in Fig. 1 is a chain block of the manual lifting and lowering type in which a load sheave 3 around which a load chain (not illustrated) is looped is rotatably supported between a pair of first and second side plates 1, 2 through bearings 5, 6. A driving shaft 7 is passed through a shaft bore of the load sheave 3 with being provided one axial end with a hand wheel 8

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around which an endless hand chain 40 (refer to Fig. 2) is looped. A transmission mechanism 10 provided with a mechanical brake 9 is disposed between the hand wheel 8 and the driving shaft 7. The driving shaft 7 is provided at its axial other end with a reduction gear mechanism 11 having a plurality of reduction gears. A driving force is transmitted to the load sheave 3 through the transmission mechanism 10 and the reduction gear mechanism 11 by actuating the hand wheel 8 through the hand chain, so that a hanging member (not illustrated) comprising a hook and the like connected to the load side of a load chain looped around the load sheave 3 can be lifted and lowered.

The side plates 1, 2 are connected to each other by three pieces of stay bolts 12 with keeping a predetermined space therebetween. A mounting shaft 14 for a hook 13 is attached between one upper portions of those side plates 1, 2 at the locations along the tangential direction of the load sheave 3.

While a wheel cover 15 for covering the hand wheel 8 is attached to the side plate 1 and fixed thereto by nuts 17 threadably engaged with the stay bolts 12, a gear cover 16 for covering the reduction gear mechanism 11 is attached to the side plate 2 and also fixed thereto by the nuts 17.

The wheel cover 15 and the gear cover 16 are provided with radial bearings 18, 19 for the driving shaft 7 respectively, so that the driving shaft 7 can be supported rotatably at its axial opposite end portions by the covers

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15. 16 through the bearings 18. 19 separately from the load sheave 3. Thereupon, a predetermined clearance is kept between the driving shaft 7 and a shaft bore of the load sheave 3 which is supported rotatably by the side plates 1. 2 through bearing 5. 6.

The hand chain 40, the hand wheel 8 and the transmission mechanism 10 constitute an actuating mechanism 20, and the embodiment illustrated in Figs. 1 and 2 is provided with an overload prevention mechanism 21.

The transmission mechanism 10 comprises a driven hub 22 joined to the drive shaft 7 so as not to rotate relatively thereto (threadably jointed to each other in Figs.), a driving member 23 threadably engaged with the driving shaft 7, a reverse prevention gear 24 interposed between the respective flange portions of the driven hub 22 and the driving member 23 and supported rotatably by the driven hub 22 and lining plates 25. 26 interposed respectively between the driven hub 22 and the reverse prevention gear 24 and between the reverse prevention gear 24 and the driving member 23. A reverse prevention pawl 27 meshed with the reverse prevention gear 24 is swingably mounted to the side plate 1 through a pawl shaft 28. This reverse prevention pawl 27, the reverse prevention gear 24, the driven hub 22, the driving member 23 and the lining plates 25. 26 constitute the mechanical brake 9.

The overload prevention mechanism 21 supports the hand wheel 8 by a cylindrical boss portion 23a of the driving

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member 23 through a one-way clutch 29 allowing to rotate in the normal driving direction, has a lining plate 30 disposed between the flange portion of the driving member 23 and a boss portion of the hand wheel 8, and also has a lining plate 31 and a press plate 32 rotatable together with the cylindrical boss portion 23a and a resilient member 33 comprising an initially coned disc spring fitted in order onto the cylindrical boss portion 23a of the driving member 23 outside the hand wheel 8, and an urging force setting adjuster 34 threadably engaged with an end of the boss portion 23a outside the resilient member 33 to optionally set a slipping load of the hand wheel 8 relative to the driving member 23 by adjusting an urging force of the resilient member 33.

Further, the reduction gear mechanism 11 comprises a first gear 35 formed integrally with a shaft end of the driving shaft 7, a pair of second gears 37, 37 supported by intermediate shafts 36, 36 respectively so as to mesh with the first gear 35, a pair of third gears 38, 38 provided in the intermediate shafts 36, 36 and a fourth gear 39 connected to an extended portion of the load sheave 3 so as to mesh with the third gears 38, 38.

Incidentally, in Fig. 1, the symbol 41 designates a wheel stopping member interposed between an axial end face of the driving member 23 and an outer ring 18a of the radial bearing 18 to restrain an axial outward shift of the hand wheel 8 through the driving member 23, the symbol 42 does a

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pawl spring adapted to urge the reverse prevention pawl 27 toward a reverse prevention gear 24, and the symbol 46 does a chain kicker.

Thus, in the above mentioned construction, when the hand wheel 8 is actuated in the normal direction by operating the hand chain, the driving shaft 7 is driven through the transmission mechanism 10 having the overload prevention mechanism 21 and the mechanical brake 9 so that the driving force is transmitted to the load sheave 3 through the reduction gear mechanism 11 to rotate the load sheave 3. Thereupon, the load side portion of the load chain 4 looped around the load sheave 3, namely the load side portion having a hook attached to its leading end thereof for hanging a cargo can be wound up to lift the cargo.

When a load larger than the slipping load set by the adjuster 34 of the overload prevention mechanism 21 acts on the load side portion of the load chain 4 at the time of lifting the cargo, the hand wheel 8 slips relative to the driving member 23 so that the cargo lifting after that is stopped. Thereupon, a level of the cargo lifted in that way is held by an action of the mechanical brake 9.

When the lifted cargo is lowered, the hand chain 40 is operated to actuate the hand wheel 8 in the reverse direction. Thereupon, the driving member 23 is retreated due to a screw effect by reversely actuating the hand wheel 8, so that the load sheave 3 is rotated reversely by alternately repeating an action and an inaction of the

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mechanical brake 9 to carry out the cargo lowering gradually.

According to the present invention, in the manual chain block having the above-mentioned constitution, lower opening edges of introducing openings 15b, 15c for the hand chain 40 formed in the wheel cover 15 are defined by using a cover holding member 50, and the lower portion of the wheel cover 15 is fixedly secured onto the side plate 1 by the stay bolt 12 through the cover holding member 50.

When explaining more in detail, as shown in Figs. 2 and 7, the wheel cover 15 is located radially outside the outer peripheral surface of the hand wheel 8 and so configured as to have an upper side portion 15d with a cover side wall 15a having opposite side extended to its turned down portions toward its left and right sides at a predetermined height, left and right side portions 15e, 15f having the introducing openings 15b, 15c for the hand chain 40 and configured along the outer peripheral portion of the hand wheel 8, and a lower tightened portion 15h joined to the lower portions of those side portions 15e, 15f with protruding radially outward relative to the outer peripheral portion of the hand wheel 8 so as to have a bolt passing opening 15g for the stay bolt 12 and adapted to sit on a seat 53 of the cover holding member 50 and to be tightened together therewith by the stay bolt 12.

In the lower tightened portion 15h of the wheel cover 15 there is provided a short cover engaging piece 15i joined

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to the side portions 15e, 15f having the introducing openings 15b, 15c formed therein and having an arcuate cross-section, and in the center portion of the wheel cover 15 there is provided a concaved portion 15j for holding the radial bearing 18 therein. Outside the concaved portion 15j there are provided an annular rib 15k and reinforcement ribs 15r extending radially outward from the annular rib 15k.

The upper side portion 15d of the wheel cover 15 has passing openings 15m for the stay bolts 15 formed at its right and left corners together with upper tightened portions 15n, 15p for nuts 17 threadably engaged with the stay bolts 12 so as to be fixed at three locations together with the lower tightened portion 15h provided in the lower portion of the wheel cover 15 when the nuts 17 are tightened relative to the stay bolts. Between the corners of the upper side portion 15d there is provided a reinforcement rib 15t running between the upper tightened portions 15n, 15p, and along the side edge portions of the respective side portions 15e, 15f there are provided reinforcement ribs 15x, 15y running between the upper tightened portions 15n, 15p and the lower tightened portion 15h. These reinforcement ribs 15x, 15y can have opened leading ends as shown in Fig. 4, but preferably have closed leading end portions in a pipe-like configuration as shown in Fig. 14.

As shown in Figs. 8 through 10, the cover holding member 50 is formed like a stay having side surfaces 51, 52 which

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define the lower opening edges of the introducing openings 15b, 15c and is provided at its lengthwise one end portion with a cover receiving portion 55 having a seat 53 onto which the inner surface of the lower tightened portion 15h of the wheel cover 15 sits and a curved engagement surface 54 with which the inner surface of the engaging piece 15i engages and provided with at its lengthwise other end portion with a pair of angular lugs 56, 57 adapted to fit into a pair of angular fitting openings 43 formed in the first side plate 1. A passing opening 53a through which the stay bolt 12 passes is formed in the seat 53, so that the cover holding member 50 can be fixedly secured to the first side plate 1 together with the cover 15 by tightening the nuts 17 threadably engaged with the projecting portions of the stay bolts 12 running along the insides of the side surfaces 51, 52 and projected from the passing opening 53a and the passing opening 15g of the tightened portion 15h respectively.

Thus, the cover holding member 50 can be fixedly secured to the first side plate 1 together with the wheel cover 15 by tightening the nut 17 threadably engaged with the stay bolt 12 at the lower side portion of the wheel cover 15 with the inner surface of the lower tightened portion 15h being seated at the seat 53 of the cover holding member 50 and the inner surface of the cover engaging piece 15i being engaged with the engagement surface of the cover receiving portion 55. Also by tightening the nuts 17 threadably engaged with

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the stay bolts 12, the upper side portion 15d of the wheel cover 15 can be fixedly secured to the first side plate 1 with the end faces of the cover side wall 15a being kept in contact with the first side plate 1 and the hand chain guides 44. 44 to be explained later interposed insides of the upper tightened portions 15n, 15p as shown in Figs. 2 and 6, so that the end faces of the cover side wall 15a are pushed against the first side plate 1 and the hand chain guides 44. 44 are fixedly secured between the inner surfaces of the upper tightened portions 15n, 15p and the first side plate 1.

Accordingly, the wheel cover 15 can be stably secured to the first side plate 1 by three pieces of stay bolts 12 as well as the introducing openings 15b, 15c whose lower opening edges are defined by the side surfaces 51, 52 of the cover holding member 50 can be provided on the opposite left and right sides of the wheel cover 15 under that secured condition.

Since the cover holding member 50 is made from another member separate from the wheel cover 15 and formed like a stay as shown in Fig. 8 to form the lower opening edges of the introducing openings 15b, 15c by its side surfaces 51, 52 in that way, it is possible to obtain a sufficient strength in comparison with a conventional embodiment which has the introducing openings formed by the cover side walls.

Thereupon, since the cover holding member 50 can have the sufficient strength as mentioned above, it is possible

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to space apart the positions of the lower opening edges from the introducing passages 60 of the hand chain 40 by narrowing a space between the side surfaces 51, 52 defining the lower opening edges, to decrease the chances of contact with the hand chain 40 by locating the side surfaces 51, 52 at the positions spaced apart from the introducing passages 60 and to decrease the generation of the contact noises and improve the durability. Further, since the cover holding member 50 can be formed separately from the wheel cover 15 made of the steel plate, it can be made of a vibration proof material such as cast iron, aluminum, synthetic resin and iron. Therefore, silence effect can be attained by the manufacturing from those materials. Thereupon, even when the hand chain 40 is brought into contact therewith, it is possible to restrain the generation of peculiar noises and at the same time to accomplish the decrease of weight by using the light material such as aluminum.

In the above-mentioned embodiment, by disposing the short cover engaging piece 15i of the arcuate cross section in the lower portion of the wheel cover 15 and making the engaging piece 15i engage with the engagement surface 54 of the cover receiving portion 55 of the cover holding member 50 the cover engaging member 15i can hold the cover receiving portion 55. Therefore, even when the impact is imposed to the wheel cover 15 from outside, it is possible to decrease the deformation of the wheel cover 15 due to the reinforcement attained by being held onto the cover

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receiving portion 55 and to stably fix the wheel cover 15 onto the first side plate 1 without any shifting of its position.

Further, in the above constitution, by interposing the vibration absorbing material 58 such as a rubber packing between the seat 53 of the cover receiving portion 55 and the inner surface of the tightened portion 15h adapted to sit on the seat 53 it is possible to effectively prevent the peculiar noises from being generated by the resonance of the cover 15 to which vibrations are transmitted when the hand chain 40 is brought into contact with the cover holding member 50.

Since the configurations of the side portions 15e, 15f of the wheel cover 15 run along the outer periphery of the hand wheel 8 as well as the lower tightened portion 15h is protruded radially downward outwardly relative to these side portions 15e, 15f, it is possible to decrease the chances of contact of the hand chain 40 with the opening edges of the introducing openings 15b, 15c formed in the side portions 15e, 15f to decrease the generation of unpleasant peculiar noises even when the hand chain 40 is operated slantly toward the axial direction of the hand wheel 8.

Next, the hand chain guide 44 will be explained hereinafter.

As shown in Figs. 2 and 3 and Figs. 6 and 7, the hand chain guide 44 comprises an attachment portion 44a having a bolt passing opening 44i and interposed between the

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tightened portion 15n, 15p of the wheel cover 15 and the stay bolt 12, a held portion 44b adapted to be engaged and held by the side plate 1 and a guide portion 44c formed between the attachment portion 44a and the held portion 44b and facing the hand wheel 8 to guide the hand chain 40 looped around the hand wheel 8 and is provided separately from the wheel cover 15. The hand chain guides 44 are fixedly secured between the side plate 1 and the tightened portions 15n, 15p of the wheel cover 15 by tightening the nuts 17 relative to the stay bolts 12.

When further explaining in detail, the hand chain guide 44 is generally formed of a thick steel plate. As shown in Figs. 11 and 12, an outer surface of the attachment portion 44a is so formed as to coincide with the inner surface of the cover side wall 15a at the tightened portion 15n, 15p of the wheel cover 15. When the attachment portion 44a is interposed between the tightened portions 15n, 15p and a stepped portion 12a of the stay bolt 12, the outer surface of the attachment portion 44a is brought into contact with the inner surface of the cover side wall 15a as shown in Fig. 12 or comes so near as to contact therewith. The guide portion 44c comprises swelled out portions 44d, 44e swelled out toward wheel flanges 8a, 8b of the hand wheel 8 to oppose thereto respectively and a concaved portion 44f concaved relative to these swelled out portions 44d, 44e. As shown in Fig. 3, the swelled out portions 44d, 44e are opposed to the wheel flanges 8a, 8b with keeping a smaller

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gap than a width of the hand chain 40 to define a guide passage 45 for the hand chain 40 together with the concaved portion 44f between the the wheel flanges 8a. 8b.

Further, the held portion 44b is joined to the swelled portion 44e with being provided at its end face with a lug 44g protruded toward the side plate 1. As a fitting hole 46 for receiving the lug 44g is formed in the side plate 1 as shown in Fig. 3, the lug 44g can be fitted into the fitting hole 46 to hold the held portion 44b by the engagement with the side plate 1.

Incidentally, it is preferable to keep the outer surface of the concaved portion 44f of the guide portion 44c in contact with the stay bolt 12, but a small gap may be provided therebetween. Further, the end face of the held portion 44b is preferably brought into pressed contact with the side plate 1 by tightening the nuts 17 relative to the stay bolt 12, but a small gap may exist therebetween in the case of engaging and holding by the lug 44g.

As mentioned above, since the hand chain guides 44, 44 are fixedly secured at the tightened portions 15n, 15p together with the cover holding member 50 by tightening the nuts 17 relative to the stay bolts 12, the hand chain 40 can be guided suitably by these hand chain guides 44, 44 allowing the hand chain 40 to be smoothly operated. Further, since each hand chain guide 44 is interposed between the inner surface of the tightened portion 15n, 15p and the stepped portion 12a of the stay bolt 12 so that its

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outer surface is brought into contact with the cover side wall 15a at the tightened portions 15n. 15p or comes near thereto as well as the held portion 44b is engaged and held by the side plate 1. a box-like section can be defined between the cover side wall 15a and the side plate 1 to strongly reinforce the wheel cover 15. Therefore, even when the impact is imposed thereto from outside, it can be received by the stay bolt 12 having a large rigidity through the attachment portion 44a to effectively restrain the deformation of the wheel cover 15.

Thereupon, since the attachment portions 44a are interposed between the tightened portions 15n. 15p and the stepped portions 12a of the stay bolts 12 as well as the lug 44 is merely fitted into the fitting hole 46 of the side plate 1 and held by the engagement therebetween, it is possible to attain the above-mentioned sufficient reinforcement and to simplify the mounting. Further, since the hand chain guides 44 are provided separately from the wheel cover 15, it is possible to improve the processability of the wheel cover 15. Since the hand chain guide 44 is a small component part, its manufacturing accuracy can be improved. Furthermore, since the attachment portions 44a are interposed and fixed between the tightened portions 15n. 15p and the stepped portions 12a of the stay bolts 12, the assembling accuracy can be improved as well as shifts of their positions can be avoided.

Further, by forming the hand chain guide 44 from the

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vibration proof material such as cast iron, aluminum and synthetic resin besides being formed of the thick steel plate it is possible to effectively restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith.

As shown in Fig. 13, by coating the whole surface of the hand chain guide 44 or at least the surface thereof facing the hand wheel 8 with the synthetic resin and the like so as to form a vibration proof layer 48 it is possible to effectively restrain the generation of peculiar noises caused by the contact with the hand chain guide 44.

Further, as shown in Fig. 3, by interposing a vibration absorbing material 49 such as the rubber packing between the attachment portion 44a and the tightened portion 15n, 15p it is possible to prevent unpleasant peculiar noises from being generated by the resonance of the wheel cover 15 even when the hand chain 40 is brought into contact with the hand chain guide 44.

The hand chain guide 44 can be readily mounted by interposing the attachment portion 44a between the tightened portion 15n, 15p and the stay bolt 12 and fitting the lug 44g of the held portion 44b into the fitting hole 46 of the side plate 1. But, its mountability can be further improved by fixing the attachment portion 44a to the tightened portion 15n, 15p mainly by means of a spot welding.

Incidentally, in the above-mentioned embodiment, though the overload prevention mechanism 21 is assembled in the

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manual actuating mechanism 20. this overload prevention mechanism 21 is not always needed and also the reduction gear mechanism 11 may be omitted.

Further, though the driving shaft 7 is supported at its axial opposite end portions by the radial bearings 18, 19 provided in the wheel cover 15 and the gear cover 16, it may be supported by the load sheave 3 or supported at its axial one end portion by one of the wheel cover 15 and the gear cover 16 and at its intermediate shaft portion by the load sheave 3.

Next, functions and advantages of the present invention as constituted above will be explained hereinafter.

Since the cover holding member 50 is provided separately from the wheel cover 15 so that the wheel cover 15 can be received by the cover receiving portion 55 of the cover holding member 50 and fixed by being tightened together with the cover 15 by the stay bolts 12, an enough strength can be obtained in comparison with the conventional embodiment in which the introducing openings are formed by the cover side wall. the durable strength of the lower opening edge of the introducing opening can be increased and the strength of the cover holding member 50 can be obtained sufficiently.

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Thereupon, the locations of the lower opening edges can be made remote from the introducing passages 60 of the hand chain 40 passing through the introducing openings by narrowing a width between the side surfaces 51, 52 defining the lower opening edges of the introducing openings. Accordingly, it is possible to decrease the chances of contact with the hand chain, to decrease the chances of generation of noises and to improve the durability. Further, since the cover holding member 50 is formed as a separate member from the wheel cover 15, it is possible to restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith and also to decrease the weight in case that it is formed from a light material such as aluminum.

Since the respective side surfaces 51, 52 of the cover holding member 50 are disposed at the locations remote from the introducing passages 60 of the hand chain 40, even when the whole of the chain block is made to jump by an abrupt and violent operation of the hand chain 40 or inclined by an effect of a large load, it is possible to decrease the chances of contact of the hand chain 40 with the side surfaces 51, 52 to improve its silencing effect and to improve the durability.

Further, since the cover holding member 50 is formed from the vibration proof material, it is possible to effectively

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restrain the generation of unpleasant peculiar noises even when the hand chain 40 is brought into contact therewith.

Since the cover engaging piece 15i is disposed in the wheel cover 15 and the engagement surface 54 is disposed in the cover holding member 50, the cover engaging piece 15i can hold the cover holding member 50. Therefore, when an impact is imposed to the wheel cover 15 from outside, it becomes possible to decrease a deformation of the cover 15 due to the reinforcement attained by holding the cover receiving portion 55 by the cover engaging piece 15i and to fix the cover 15 onto the side plate 1 stably without causing a shift of its position.

Further, since the seat 53 is formed in the cover receiving portion 55 and the vibration absorbing material 58 such as a rubber packing is interposed between the seat 53 and the inner surface of the wheel cover 15, even though the hand chain 40 comes into contact with the cover holding member 50, it becomes possible to effectively prevent large abnormal noises from being generated by a resonance of the wheel cover 15 caused by contact vibrations transmitted to the cover 15 and to improve a sound proof effect.

Since the left and right side portions 15e, 15f of the wheel cover 15 provided with the introducing openings 15b, 15c is so formed as to extend along the outer peripheral portion of

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the hand wheel 8 and the lower tightened portion 15h is so formed as to protrude radially outward relative to the outer peripheral portion of the hand wheel 8, even though the hand chain 40 is operated slantly relative to the axial direction of the hand wheel 8. it is possible to decrease such a chance that the hand chain 40 is brought into contact with opening edges of the introducing openings 15b, 15c formed in the side portions 15e, 15f and to restrain the generation of unpleasant abnormal noises.

Since the hand chain guides 44 comprise the attachment portions 44a, the held portions 44b and the guide portions 44c with the attachment portions 44a being interposed between the tightened portions of the wheel cover 15 by the stay bolt 12 and the stay bolts 12 and the held portion 44b being adapted to be engaged and held by the side plate 1, they can be strongly fixed between the tightened portions of the wheel cover 15 and the side plate 1 without causing a shift of their positions by tightening the stay bolts 12 without welding. Owing to that fixing therebetween without any welding, it becomes possible to improve the assembling capability. Further, since the hand chain guide 44 is formed separately from the wheel cover 15 and fixed therebetween as mentioned above, it is possible to improve the workability of the wheel cover 15 and also to improve the processing accuracy. Furthermore, since the attachment portions 44a are interposed between the tightened portions

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and the stay bolts 12 and fixed therebetween. it is possible to improve the assembling accuracy without causing a shift of the assembly position.

In addition thereto, since the hand chain guide 44 has the attachment portion 44a interposed between the tightened portion and the stay bolt 12 and the held portion 44b held and engaged with the side plate 1, it is possible to define a box-like section together with the cover side wall 15a of the wheel cover 15 and the side plate 1, so that the wheel cover 15 can be reinforced sufficiently by the hand chain guides 44.

Since the outer surface of the attachment portion 44a is so formed as to coincide with the inner surface of the cover side wall 15a, the outer surface of the attachment portion 44a is brought into contact with the inner surface of the cover side wall 15a or comes near thereto. Therefore, when an impact is imposed thereon from outside, the cover side wall 15a is going to deform inward. But, that impact is received by the stay bolts of the high rigidity through the attachment portions 44a of the hand chain guides 44 to restrain a deformation of the wheel cover 15 effectively, so that a reinforcement function for the wheel cover 15 can be further improved.

Since the guide passage 45 is formed in the guide portion 44c, even the hand chain 40 jumps within the wheel cover 15.

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it is possible to prevent the chain 40 from getting out of the hand wheel 8 and it becomes possible to carry out a smooth operation of the hand chain 40.

Since the hand chain guide 44 is formed from a vibration proof material, even when the hand chain 40 is brought into contact with the hand chain guides 44, it is possible to restrain the generation of peculiar noises. According to the invention as set forth in claim 11, since the vibration proof layer 48 is formed on the guide portion 44c of the hand chain guide 44, similarly to the hand chain guide 44 formed from the vibration proof material, it is possible to restrain the generation of peculiar noises even when the hand chain 40 is brought into contact therewith.

Since the vibration absorbing material 49 such as the rubber packing is interposed between the attachment portion 44a and the tightened portion of the wheel cover 15, even when the hand chain is brought into contact with the hand chain guide 44, it is possible to prevent unpleasant peculiar noises from being generated by the resonance of the wheel cover 15. Further, according to the invention as set forth in claim 13, since the attachment portions 44a of the hand chain guides 44 are fixed to the tightened portions of the wheel cover 15 by means of a spot welding, it is possible to improve the interposing workability for interposing the hand chain guides 44 between the wheel cover 15 and the side

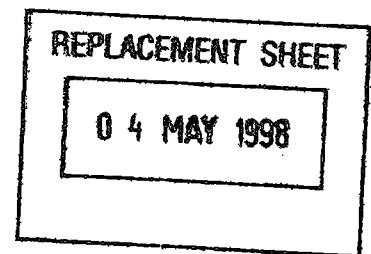


plate 1. Thereupon, since that fixation is not intended to reinforce the wheel cover 15 by the hand chain guides 44 but merely intended to connect them for preventing the separation therebetween, it is possible to not only improve the mountability but also reinforce the wheel cover 15 sufficiently by the above mentioned fixation.

Since the held portion 44b is provided with the lug 44g so that the lug 44g can be fitted into the fitting hole 46 formed in the side plate 1 to hold the held portion 44b by engagement with the side plate 1, the hand chain guide 44 can be strongly secured and held by the side plate 1. Thereupon, the box-like section defined by the side wall 15a, the side plate 1 and the hand chain guide 44 can be made stronger so that the reinforcement of the wheel cover 15 can be accomplished more securely by that box-like section.

It will be understood that the above description has been given with reference to preferred embodiments of the invention. However, various modifications may be made within the scope of the invention as defined by the following claims.



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4. A manual chain block as set forth in claim 1, wherein said wheel cover has a short cover engaging piece (15i) having an arcuate cross-section disposed between the lower portions of said introducing openings (15b, 15c) for the hand chain, and an engaging surface (54) adapted to engage with the inner surface of said cover engaging piece (15i) is formed in the cover receiving portion of said cover holding member (50).

5. A manual chain block as set forth in claim 1, wherein said cover receiving portion has a seat (53) onto which the inner surface of said wheel cover (15) sits, and a vibration absorbing material (58) is interposed between the seat (53) and the inner surface of said wheel cover (15).

6. A manual chain block as set forth in claim 1, wherein said wheel cover (15) is located radially outside an outer peripheral portion of said hand wheel (8) and comprises an upper side portion (15d) having a cover side wall (15a) extending to its turned down portions toward its left and right sides, left and right side portions (15e, 15f) having the introducing openings (15b, 15c) for the hand chain and extending along the outer peripheral portion of said hand wheel (8) and a lower tightened portion (15h) joined to the lower portions of said side portions (15e, 15f) with protruding radially outward relative to the outer peripheral portion of said hand wheel (8) and adapted to sit on said cover holding member (50) and to be tightened together with said cover holding member by the stay bolt means (12).



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7. A manual chain block as set forth in claim 1, wherein said hand chain guide (44) comprises an attachment portion (44a) interposed between a tightened portion of said wheel cover (15) by the stay bolt (12) and the stay bolt (12), a held portion (44b) adapted to be engaged and held by said side plate (1), a guide portion (44c) formed between said attachment portion (44a) and said held portion (44b) and facing said hand wheel (8) to guide said hand chain (40) looped around said hand wheel (8), so that the hand chain guides (44) can be secured between said side plate (1) and the tightened portions of said wheel cover (15) by tightening the stay bolts (12).

8. A manual chain block as set forth in claim 7, wherein the attachment portion of said hand chain guide has an outer surface (44a) which coincides with the inner surface of said cover side wall (15a) of the tightened portion of the wheel cover (15).

9. A manual chain block as set forth in claim 7, wherein the guide portion (44c) of said hand chain guide (44) has swelled-out portions (44d, 44e) swelled out towards wheel flanges (8a, 8b) of said hand wheel (8) respectively to oppose thereto, and these swelled-out portions (44d, 44e) are opposed to the wheel flanges (8a) with keeping a smaller gap than a width of the hand chain (40) to define a guide passage (45) for the hand chain (40) together with the wheel flanges (8a, 8b) therebetween.

10. A manual chain block as set forth in claim 7, wherein said hand chain guide (44) is formed from a vibration proof



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material.

11. A manual chain block as set forth in claim 7, wherein a vibration proof layer (48) is formed on the surface of the guide portion (44c) of said hand chain guide (44) at least on the side of hand wheel (8).

12. A manual chain block as set forth in claim 7, wherein a vibration absorbing material (49) is interposed between the attachment portion (44a) of said hand chain guide (44) and the tightened portion of said wheel cover (15).

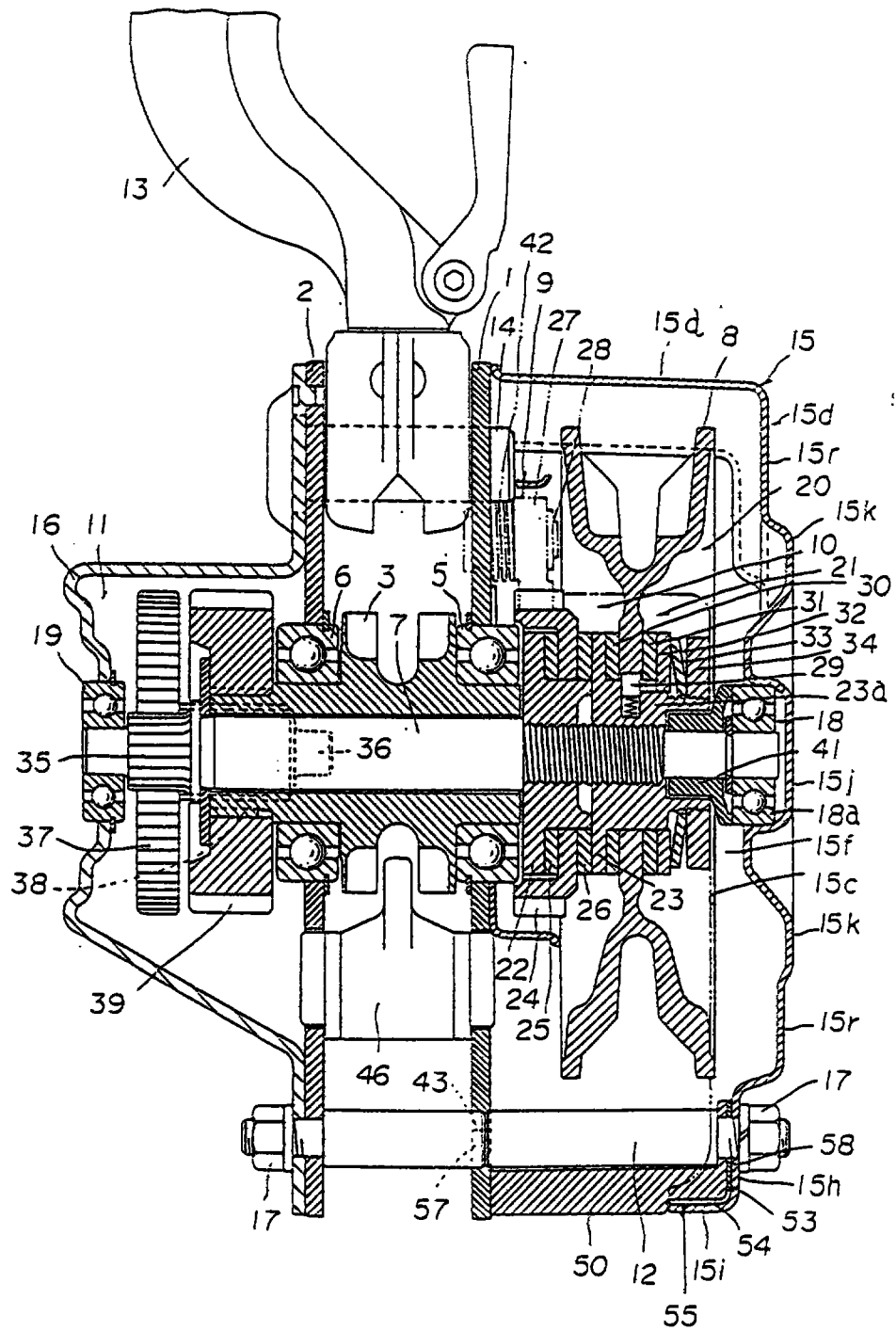
13. A manual chain block as set forth in claim 7, wherein the attachment portion (44a) of said hand chain guide (44) is fixed to the tightened portion of said wheel cover (15).

14. A manual chain block as set forth in claim 7, wherein the held portion (44b) of said hand chain guide (44) is provided with a lug (44g) protruded from its end portion, and said side plate (1) is provided with a fitting hole (46) for receiving said lug (44g).

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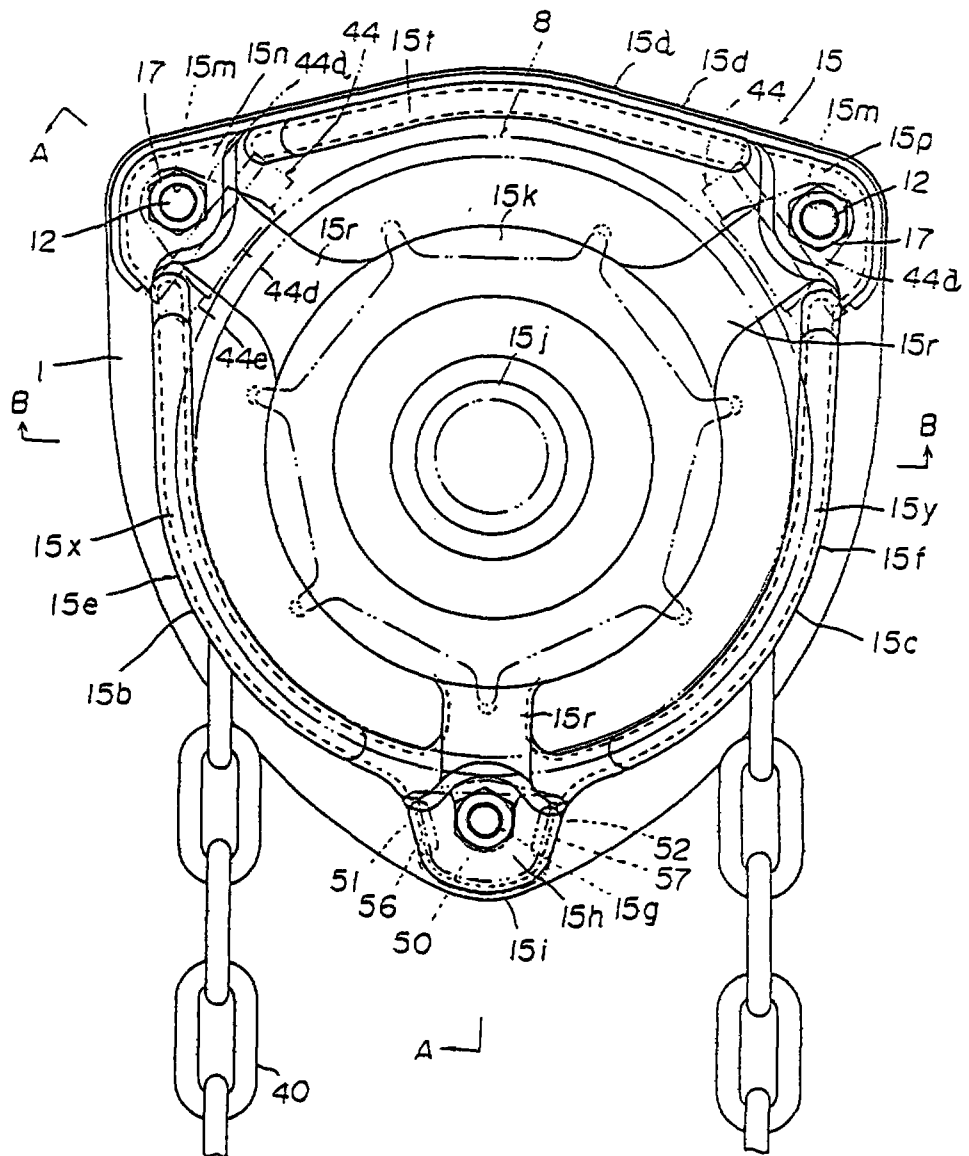
FIG. 1



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FIG.2



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FIG.3

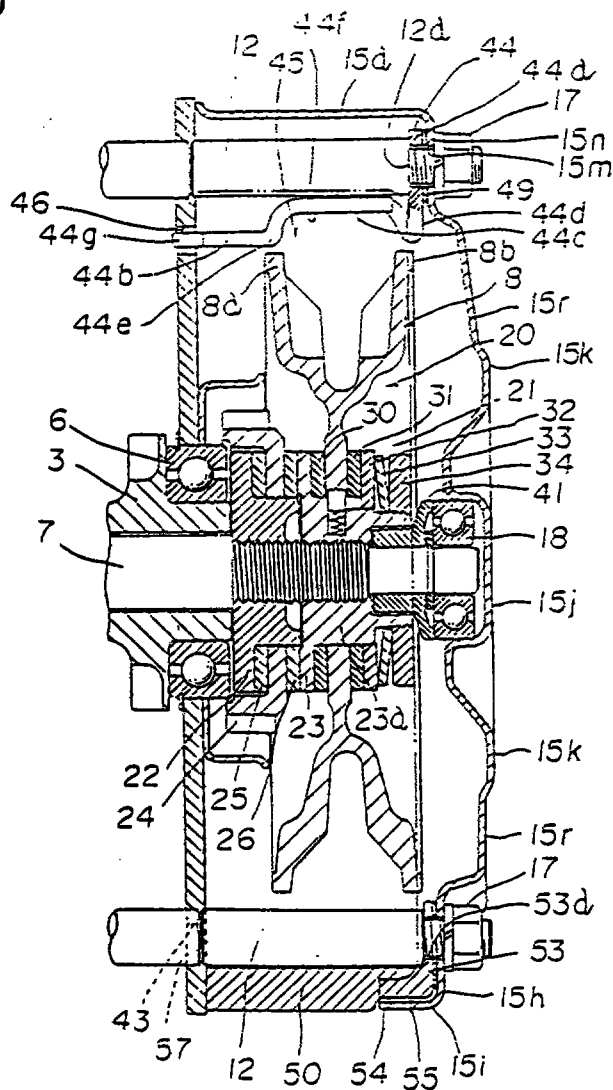
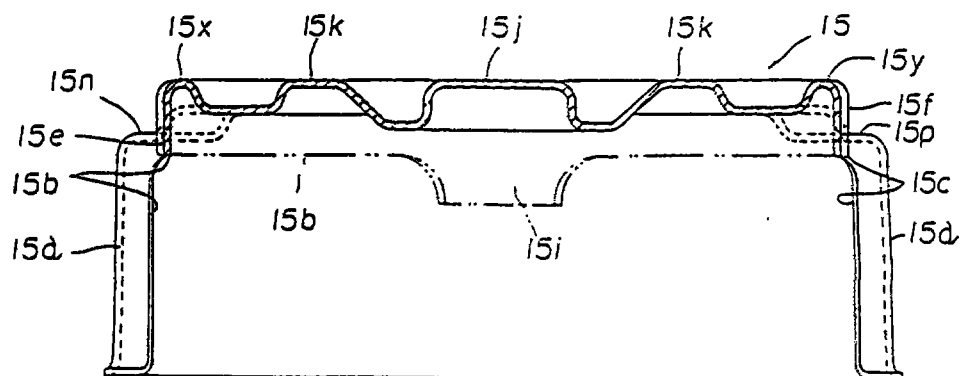


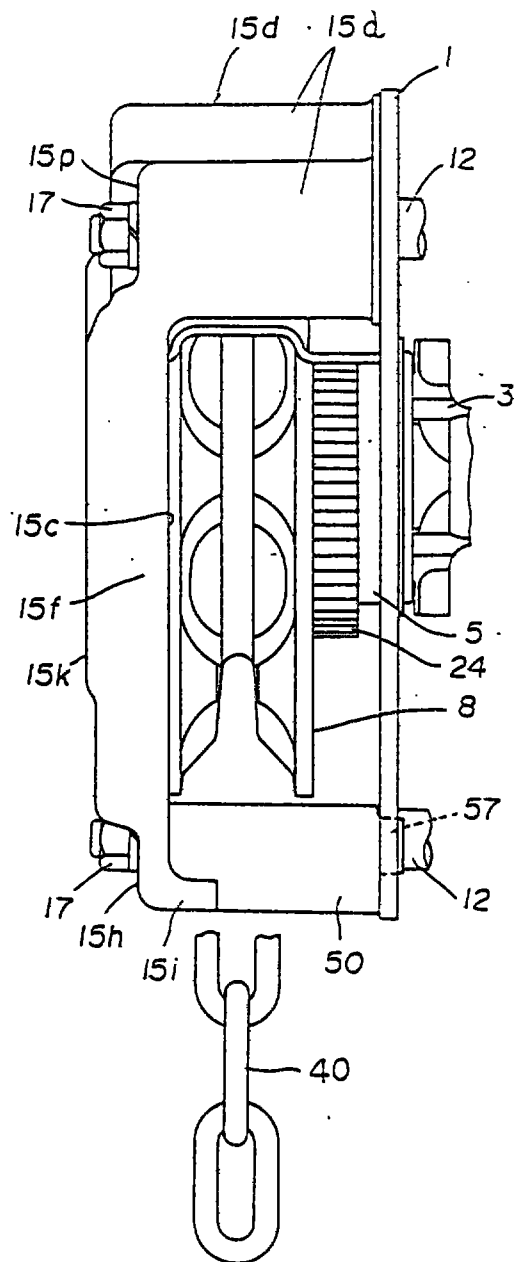
FIG.4



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FIG.5



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FIG.6

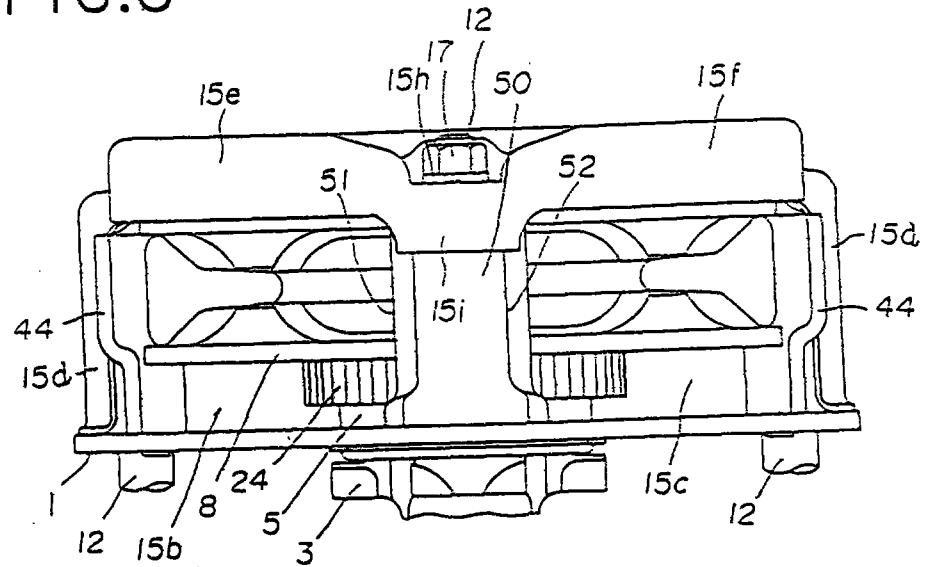
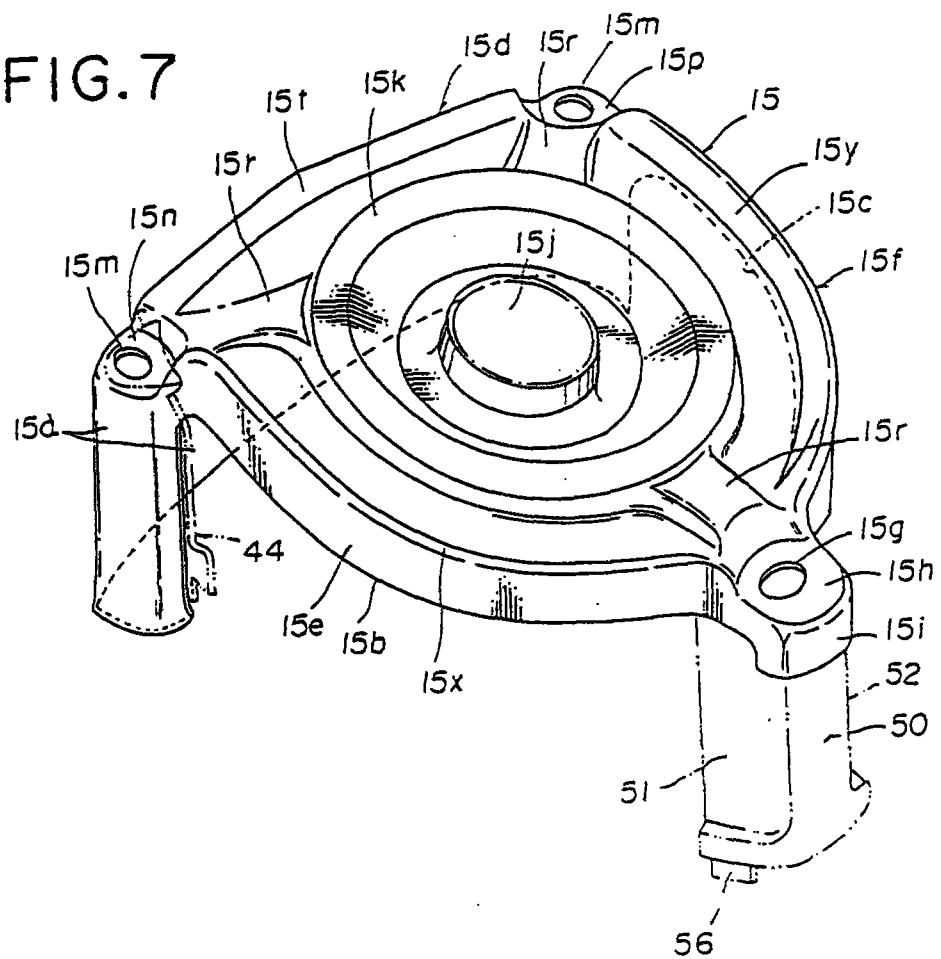


FIG.7



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FIG.8

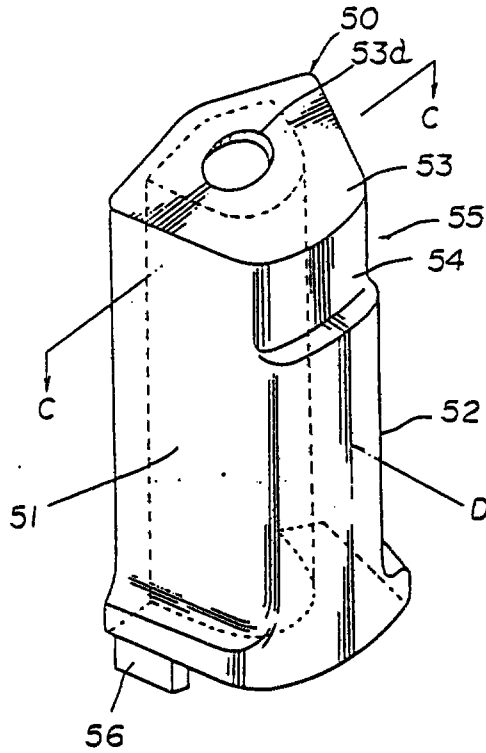


FIG.10

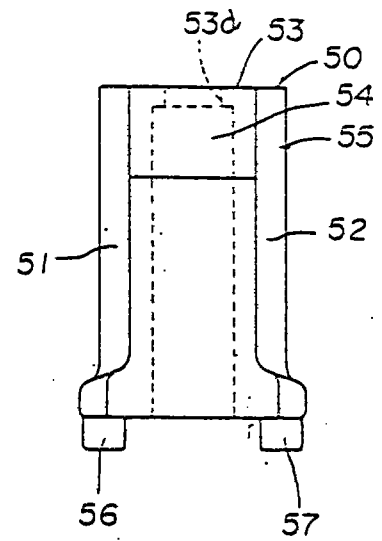


FIG.9

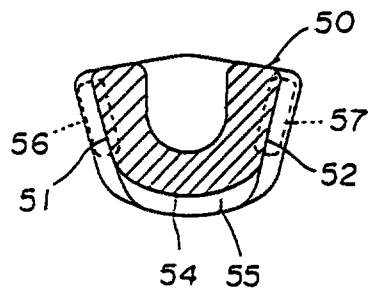


FIG.11

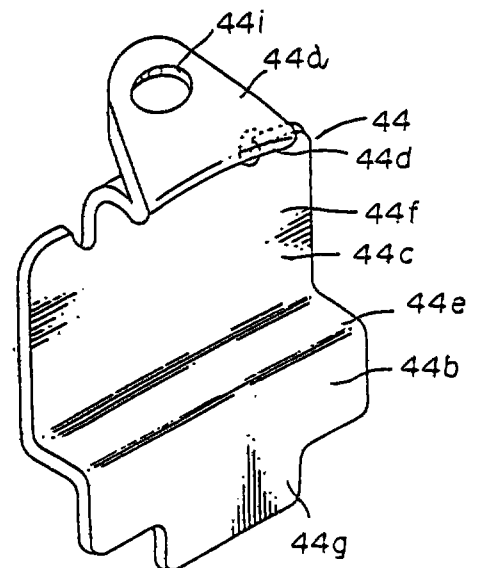


FIG.12

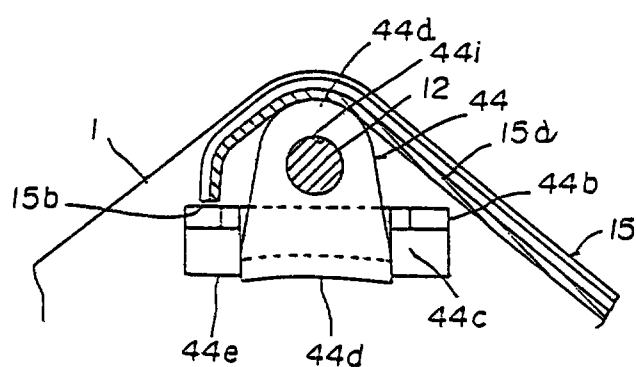


FIG.13

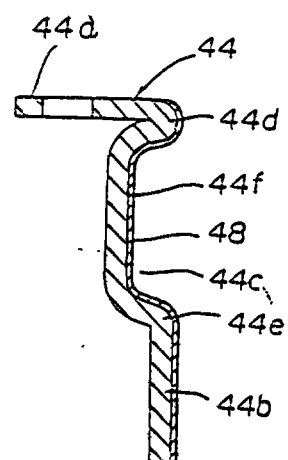
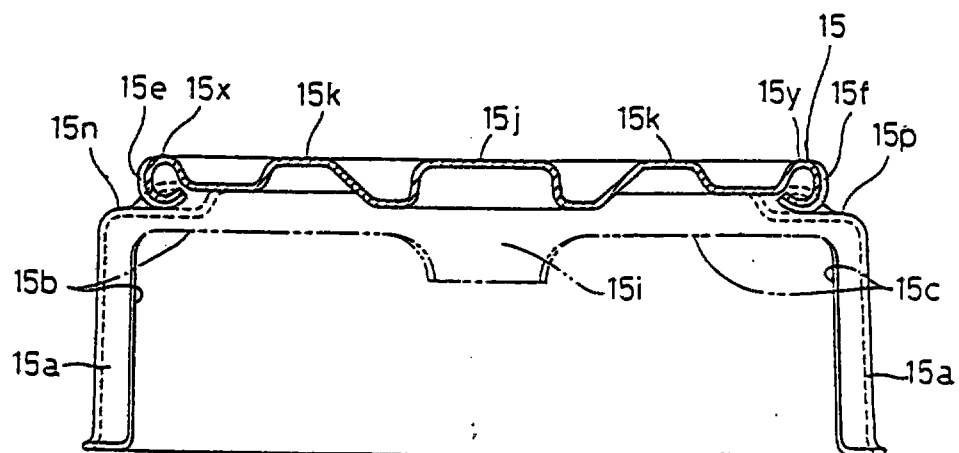


FIG.14

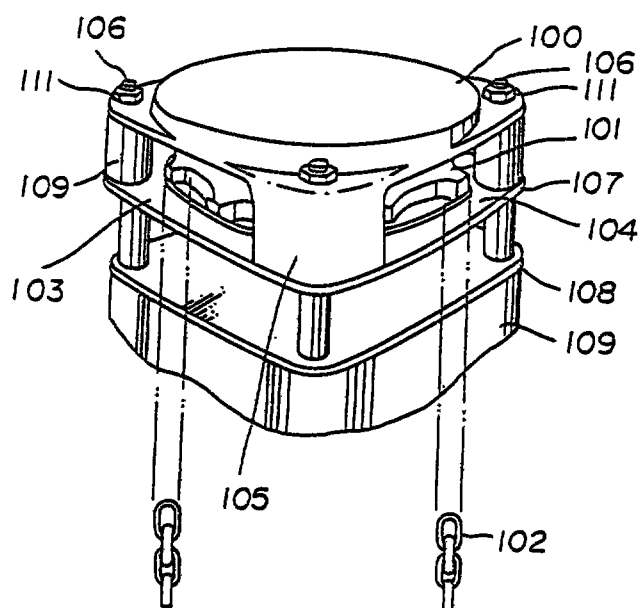


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FIG.15

PRIOR ART



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CLAIMS

1. A manual chain block including a pair of side plates (1,2), a load sheave (3) which is supported rotatably between said side plates and around which a load chain is looped, an actuating mechanism (20) which is disposed outside one (1) of said side plates and has a hand wheel (8) for actuating said load sheave (3) and a wheel cover (15) which is attached to the one of said side plates (1) to cover said actuating mechanism (20) and has introducing openings (15b, 15c) for a hand chain (40) looped around said hand wheel (8), wherein between said introducing openings (15b, 15c) there is provided a cover holding member (50) having side surfaces (51, 52) which face introducing passages (60) for said hand chain (40) and define lower opening edges of said introducing openings (15b, 15c) and a cover receiving portion (55) for receiving said wheel cover (15) located between the introducing openings (15b, 15c) and said cover holding member (50) is tightened together with said cover (15) to said side plate (1) by stay bolt means (12).
2. A manual chain block as set forth in claim 1, wherein said respective side surfaces (51, 52) are disposed at locations spaced apart from said introducing passages (60) for said hand chain (40).
3. A manual chain block as set forth in claim 1, wherein said cover holding member (50) is formed from a vibration proof material.